3 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter combines the affected environment and environmental consequences discussion and analysis into one chapter. The affected environment section describes the existing environmental resources of the project area, including the conditions in the human and natural environment that have the potential to be affected by the project alternatives. The regulatory setting is described and applicable statutory and regulatory requirements are presented. The environmental consequences section examines the consequences of implementing the No Action alternative and five action alternatives as they are described in Chapter 2. The information presented in Chapter 3 forms the basis for the environmental comparative analysis presented in the table at the end of Chapter 2. Some of the analyses are based on technical studies and reports that appear as appendices to this Draft Environmental Impact Statement (DEIS).

For each environmental resource, impact categories were identified and impact levels identified. The significance of impacts was established in a variety of ways such as regulatory standards and policies, technical reports completed in the project area, accepted industry standards and thresholds, and the affected region and interests. Direct, indirect, and cumulative impacts were identified. Mitigation measures are presented as appropriate.

Direct Impacts. Direct impacts are those that would be caused by the action (i.e., garnet mining and related activities) and would occur at the same time and place as the action. Direct impacts were determined by assessing the initial effects (short-term impacts) of garnet mining activities and the post mining condition (long-term effects) once reclamation efforts are completed.

Indirect Impacts. Secondary or indirect impacts result from activities or actions that may be triggered by the project but which are not directly linked, and which may occur either later in time or are further removed in distance. An example of a secondary impact related would be increased secondary employment and tax revenues to the local government.

Cumulative Impacts. Cumulative impacts result from the incremental effect of a project when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (federal or non-federal) or person undertakes the actions. Cumulative impacts can result from individually minor, but collectively significant, actions taking place over a period of time. Cumulative impact assessment necessarily involves assumptions and uncertainties.

Mitigation Measures. Mitigation measures were analyzed to determine their reasonableness and effectiveness in reducing either the magnitude or duration of impacts. The National Environmental Policy Act (NEPA) does not require that an impact be significant before identifying a mitigation measure. Emerald Creek Garnet Ltd. (ECG) would be required to implement reclamation and mitigation measures for any of the action alternatives. Therefore, the application of the reclamation, mitigation, and Best Management Practices (BMPs) are considered before determining residual impacts. Within each resource section, mitigation measures are presented as appropriate.

Region of Influence. The region of influence (ROI) is the geographical region that would be expected to be affected in some way by the proposed action or alternatives. The size and location of the ROI varies from resource to resource. For example, the ROI for water resources may consist of the watershed within which a project is proposed; while for socioeconomics the ROI may be the county in which the project is located.

3.1 Water Resources

The attributes of water resources to be addressed include regional hydrology, channel morphology, floodplains, surface and groundwater quality, and groundwater quantity. The ROI for water resources is the St. Maries River watershed.

3.1.1 Affected Environment

3.1.1.1 Surface Hydrology

The project area is located within the St. Maries River watershed, a 485 square mile watershed comprising approximately 25 percent of the larger, 1,860 square miles St. Joe subbasin (Hydrologic Unit Code [HUC] 17010304). The calculated contributing drainage extent at the project area, located between Emerald Creek and Carpenter Creek, is 205 square miles and spans river mile 35 through 38 of the St. Maries River. The St. Maries headwaters begin about 6 miles southeast of Clarkia and the river flows over 40 miles northwest to the St. Joe confluence near the town of St. Maries, about 10 miles upstream of Lake Coeur d'Alene. The St. Maries watershed averages 15 miles across and ranges in elevation from 2,100 feet to 6,300 feet (Figure 3.1-1). Relatively flat fluvial plateau lands dominate the watershed below 3,000 feet. The watershed portion above 3,000 feet is characterized by fluvial mountain lands with sharp crests and V-shaped confined canyons. The St. Maries River geomorphology changes in the downstream direction from unconfined valley in the upper reaches to semi-confined canyon near Fernwood to confined canyon near Mashburn (Columbia Basin Fish and Wildlife Authority [CBFWA] 2002).

The majority of the St. Maries River is characterized as a low gradient, broad, meandering channel comprising fine alluvial materials and deposits from the ancient Lake Clarkia. Within the project area, the river reach averages about 120 feet wide and 7 feet deep, with a mean flow of 217 cubic feet per second (cfs) and mean velocity of 1.05 feet per second (United States Geological Survey [USGS] 2002).

Within the St. Maries River watershed there are more than 15 perennial tributaries totaling 300+ stream miles (CBFWA 2002). Six tributaries flow into the St. Maries River in, or adjacent to, the project area including Carpenter Creek, Emerald Creek, Olson Creek, Hatton Creek, Pierce Creek, and Adams Creek. Carpenter, Emerald, Adams, and Olson creek flow directly into the St. Maries River but Hatton Creek flows into an oxbow and has no channeled connection (refer to Figure 1-2). During low flows, a human-made channel diverts Pierce Creek around an oxbow, directly into the St. Maries River. During high flows, Pierce Creek flows into the oxbow via its natural channel (Kuzis 2002). The physical characteristics of each tributary are summarized in Table 3.1-1.

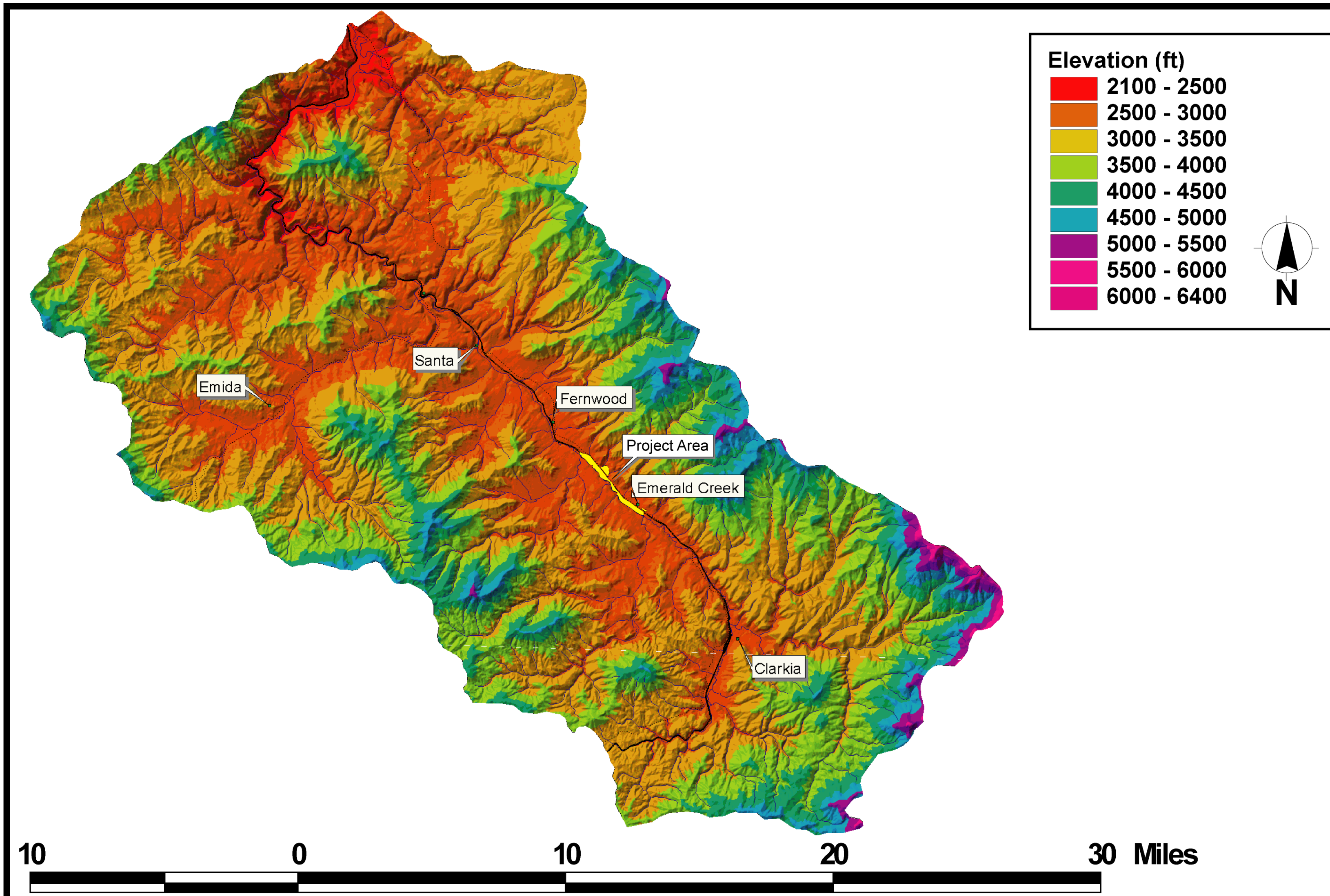

FIGURE 3.1-1
ST. MARIES RIVER
WATERSHED ELEVATION

Table 3.1-1. Project Area Tributary Characteristics

Creek	*Drainage Size (acres)*	*Seasonality*	*Gradient*	*Sinuosity*
Carpenter	12,633	Perennial	3.0%	1.13
Emerald	11,828	Perennial	4.5%	1.15
Olson	5,500	Perennial	9.8%	1.13
Adams	1,700	Perennial	16.0%	1.06
Hatton	1,000	Seasonal	5.8%	1.15
Pierce	700	Seasonal	5.3%	1.11

Source: Kuzis 2002

The dominant landcover classifications for the St. Maries River watershed are Mixed Mesic Forest (23 percent), Western Red Cedar/Grand Fir Forest (13 percent), Standing Burnt/Dead Timber (8.5 percent), and Douglas fir (8 percent). Grasslands make up less than 4 percent of the watershed and agricultural lands account for less than 1 percent (Idaho Cooperative Fish and Wildlife Research Unit 1999). There are several wetland areas within the extensive floodplain adjacent to the St. Maries River. The 1910 fire, logging, road building, mining, fire suppression, and grazing have affected the watershed vegetation and hydrologic processes.

Climate

The regional climate is governed by maritime air masses from the Pacific coast and prevailing westerly winds, altered by continental air masses from Canada (CBFWA 2002). Summer tends to be dry and mild with average daily high temperatures in the 80s, while average daily low temperatures in the winter are in the 20s, as recorded at the St. Maries weather station (see Figure 3.1-2). The region receives an average annual precipitation of 37 inches, with the majority falling in mid-winter as a result of long duration, low intensity cyclonic storms. Seasonal snow pack conditions from November to May are typical above 4,500 feet. A "rain-on-snow zone" has been identified for elevations between 3,000 feet and 4,500 feet (CBFWA 2002).

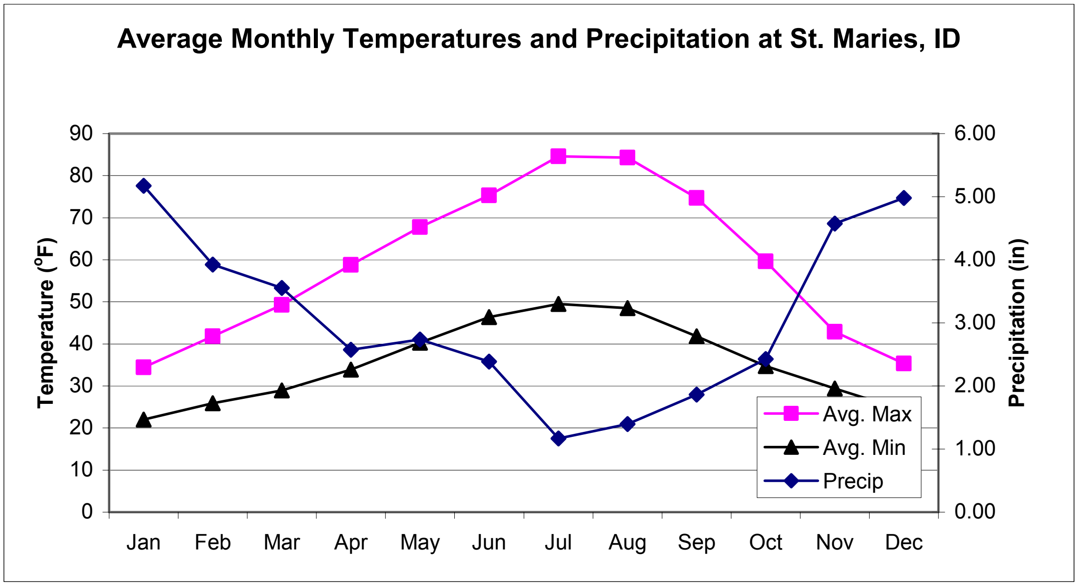

Figure 3.1-2. Average Monthly Temperatures and Precipitation at St. Maries, ID

Water Quality

The St. Maries River Subbasin Assessment and Total Maximum Daily Load (TMDL) (Idaho Department of Environmental Quality [IDEQ] 2003) indicates that the St. Maries River watershed is listed under Clean Water Action §303(d) as not meeting Idaho water quality standards for sediment and temperature, habitat alteration, nutrients, pathogens, and dissolved oxygen. The St. Maries River itself, from Clarkia to Mashburn, is 303(d) listed for sediment and temperature. This reach of the St. Maries River extends from 6 miles upstream of the project area to 12 miles downstream of the project area. The TMDL identifies the designated beneficial uses of the St. Maries River as cold water biota, primary contact, domestic water supply, and special resource water (IDEQ 2002).

Limited water quality data for the St. Maries River subbasin have been collected at the USGS Santa gage during the period of 1994 to 2000. During this time period, only a single exceedence of the temperature criterion for cold water use occurred. Monitoring conducted by IDEQ during the months of July, August, and September (year unknown) indicated that temperature standards were routinely exceeded on Emerald Creek. Carpenter Creek was not assessed as part of this study (IDEQ 2003).

Stream Flow Characterization

A flood analysis was performed using streamflow measurements recorded at the USGS gage station near Santa for the 34-year period of record dating from 1966 to 2000. The values have been adjusted to correspond with the project site, located 8 miles upstream from the Santa gage. A Log-Pearson Type III distribution was applied to the 34 years of historical USGS Santa gage data to obtain the flood frequency analysis presented in Table 3.1-2. Based on a flow analysis using these values and surveyed stream cross-sections, the St. Maries River at the project site can be expected to overflow for two-year peak events. The stream cross-section survey determined the St. Maries channel to be approximately 120 feet from bank-to-bank and 7 feet deep. The stream reach drops about 1.5 feet per 1,000 feet reach.

Table 3.1-2. Site Event Streamflow Values (cfs)

1-year	*2-year*	*5-year*	*10-year*	*25-year*	*50-year*	*100-year*	*200-year*
540	2,251	3,805	4,998	6,683	8,098	9,565	11,196

The highest recorded peak flows at the Santa gauge have occurred in mid-winter due to relatively mild storms producing rain-on-snow events. These events cause rapid snowmelt, which in turn cause significant flooding when snowmelt runoff combines with the stormwater runoff. The impacts of this phenomenon are further compounded by the fact that the regional soils are frozen and/or saturated and are unable to infiltrate the rapidly accumulating runoff. Average monthly stream flow tends to be highest in April to May (approximately 620 cfs on average) and lowest in September (approximately 45 cfs on average). Figure 3.1-3 depicts average stream flows within the St. Maries River based on 34 years of recorded data from 1966 to 2000.

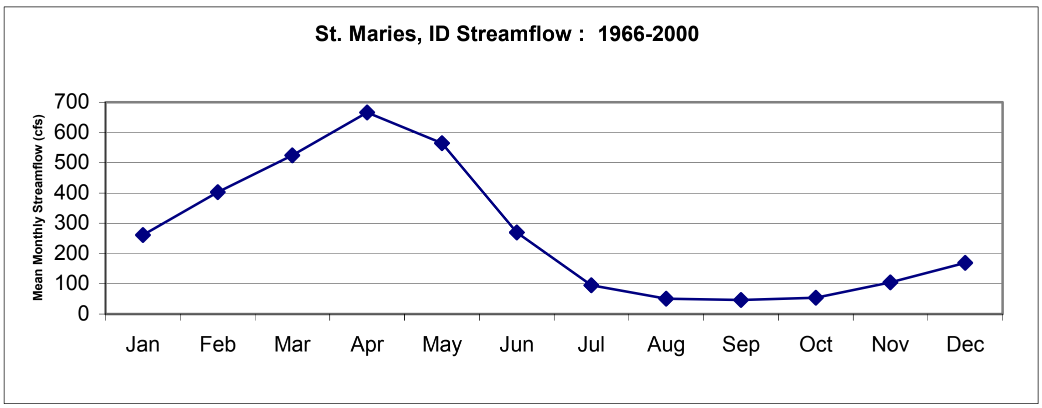

Figure 3.1-3. Average Monthly Streamflow

Floodplains

The project area is partially located within the 100-year floodplain, as depicted in Figures 3.1-4 and 3.1-5. In 1996, a storm event in excess of the 100-year event (10,800 cfs) was recorded at the Santa gage, corresponding to a flow of 8,050 cfs at the project site.

Water Supply

The St. Maries River watershed is one of the few remaining watersheds in Idaho that is not stressed by water usage. There are no large consumptive uses and mining activities have not substantially affected water supply (personal communication, Ondrecan 2002).

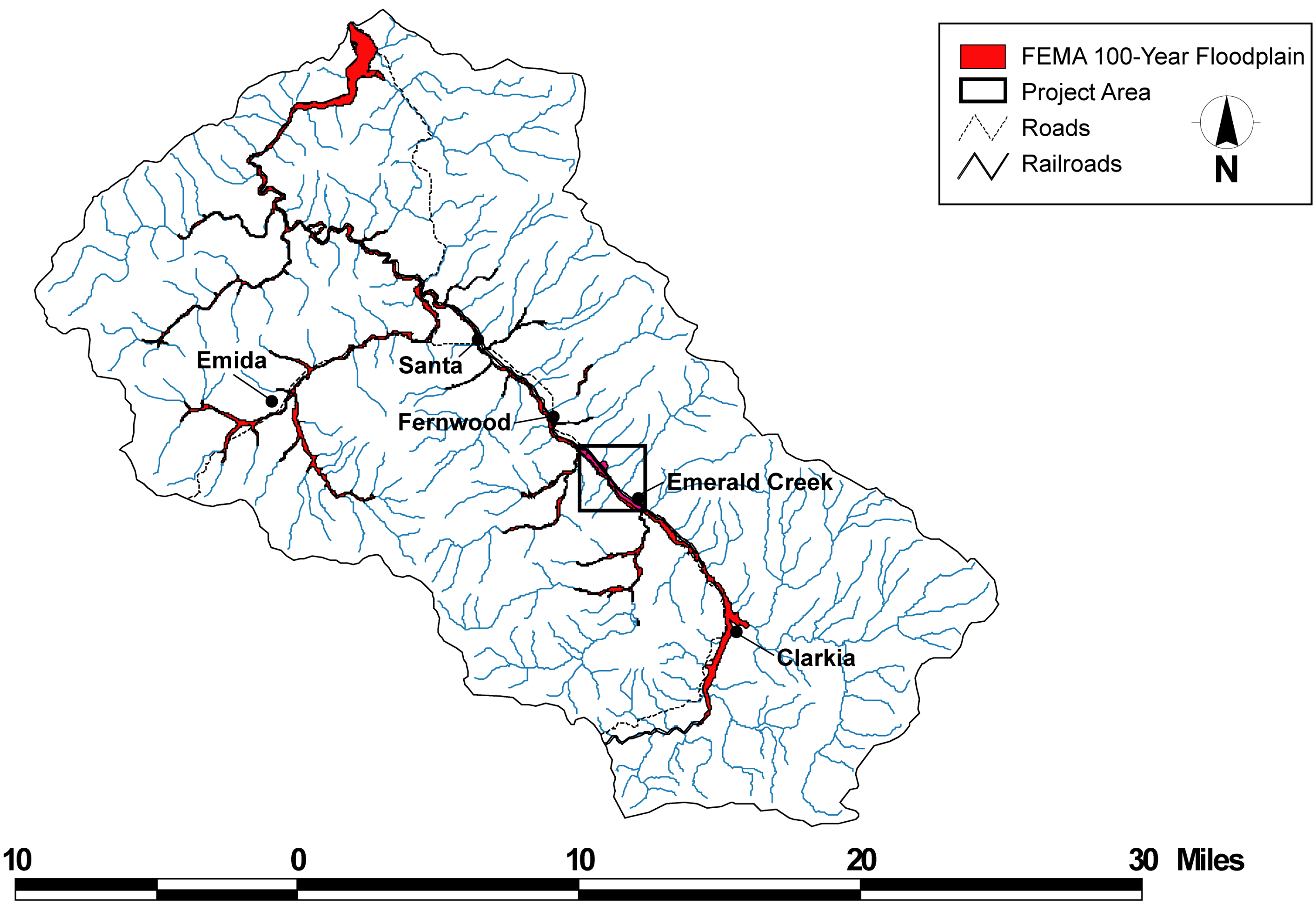

FIGURE 3.1-4
FEMA 100-YEAR FLOODPLAIN
ST. MARIES RIVER WATERSHED

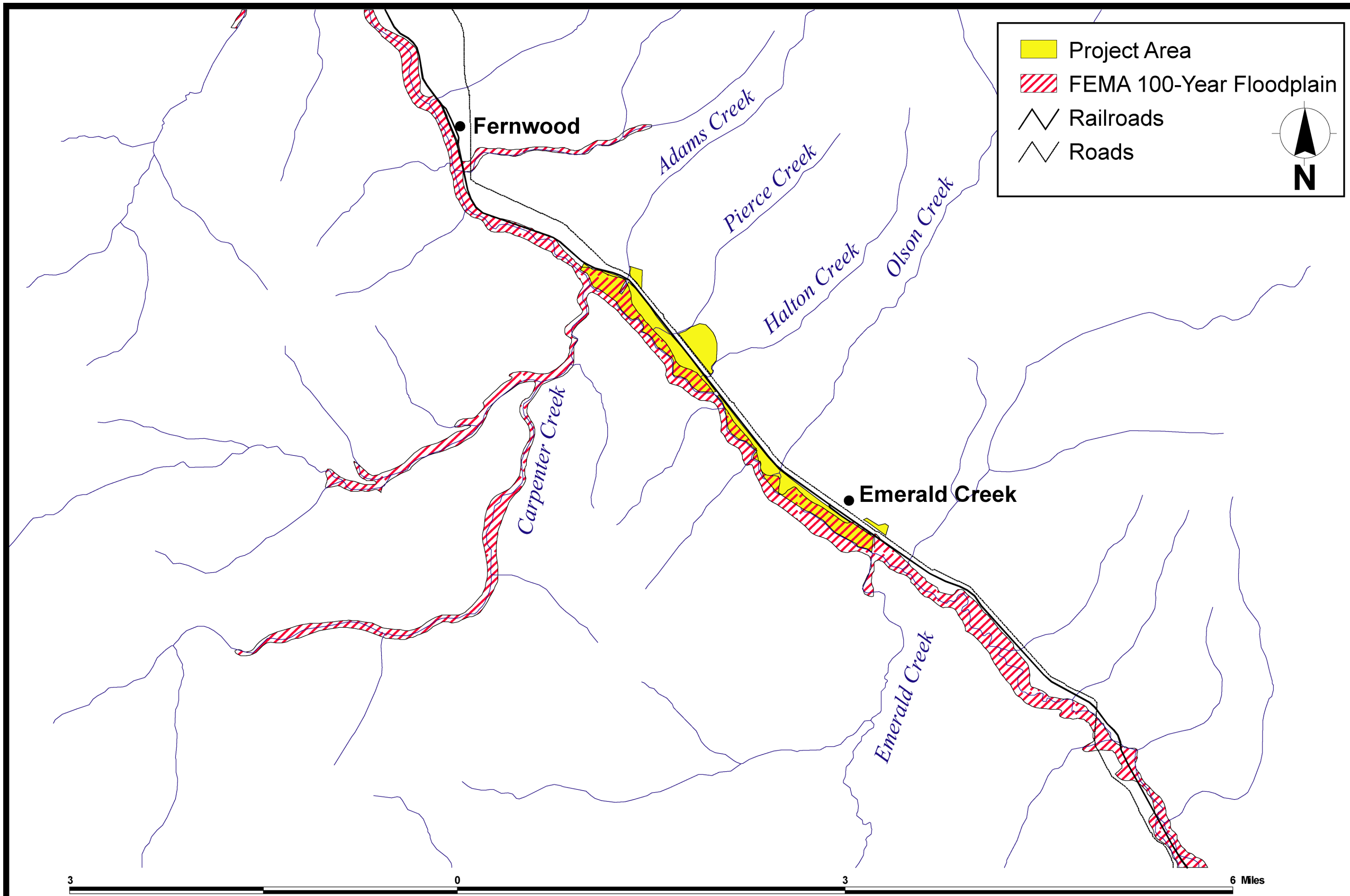

FIGURE 3.1-5
FEMA 100-YEAR FLOODPLAIN
FOR PROJECT AREA

3.1.1.2 Groundwater

Regional Aquifers

The St. Maries River watershed is located on the very eastern edge of the Columbia Plateau regional aquifer system where the local aquifers are generally discontinuous and isolated (United States Environmental Protection Agency [USEPA] 1994). The Columbia Plateau aquifer system is illustrated in Figure 3.1-6. The aquifers comprise very hard and dense layers of tertiary basalt separated by horizontal interflow layers of loose, rubbly basalt and sediments. These interflow layers allow for easily transmitted water when drilled due to their high porosity and permeability. Well productivity varies greatly depending on which interflow layer is being pumped.

Groundwater Monitoring

In 1998, four shallow groundwater-monitoring sites were established within the project area by ECG to measure subsurface water in shallow alluvium overlying Clarkia clays (Table 3.1-3). The monitoring wells were drilled in upland, wetland, and river top-of-bank areas in the Pokey-Typic Fluvaquents soil complex (see Volume II Appendix E for monitoring well locations). Depth to shallow groundwater was measured weekly during the period of December 1998 to October 2000. The seasonal groundwater levels fluctuated approximately 3 feet in elevation. Groundwater levels peaked in early spring and were lowest in late summer, which correlates with the St. Maries River water surface elevations as depicted in Figure 3.1-7. Well GMS4, located in the oxbow complex adjacent to the river, measured surface to groundwater depths from 0.8 to 4.3 feet from April to September.

Table 3.1-3. Groundwater Monitoring Sites

Groundwater Monitoring Station ID	*Distance to St. Maries River Bank (feet)*	*Monitoring Station Surface Elevation (feet)*
GMS1	800	2726.4
GMS2	470	2725.4
GMS3	220	2723.4
GMS4	15	2723.5

Note: The groundwater elevations are for the well GMS4 located 15’ from the stream bank.

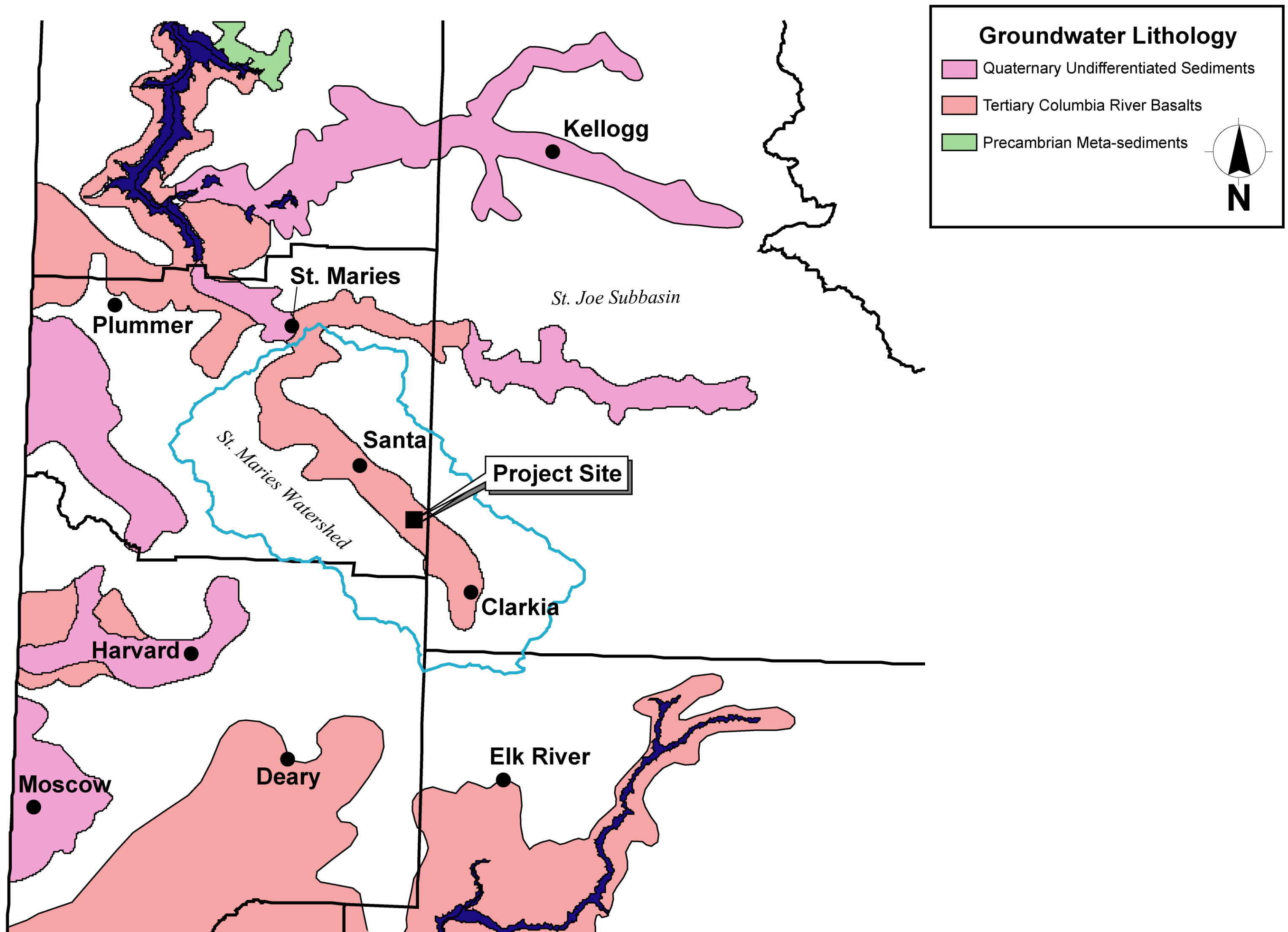

FIGURE 3.1-6
GENERAL GROUNDWATER LITHOLOGY

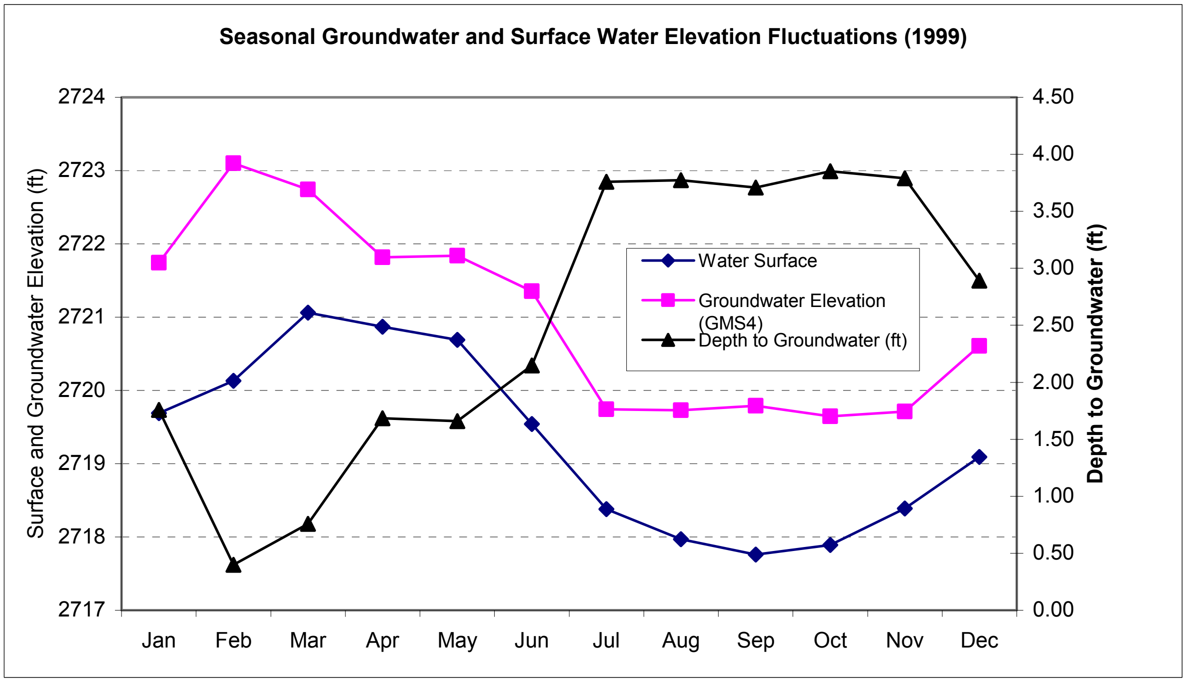

Figure 3.1-7. Groundwater and Surface Water Elevation Fluctuations

The hydraulic gradient, calculated to be an average of 0.0020 ft/ft, slopes toward the St. Maries River and supports the premise that the river is a gaining reach within the project area and that the river is hydraulically connected to the oxbow complexes (Figure 3.1-8).

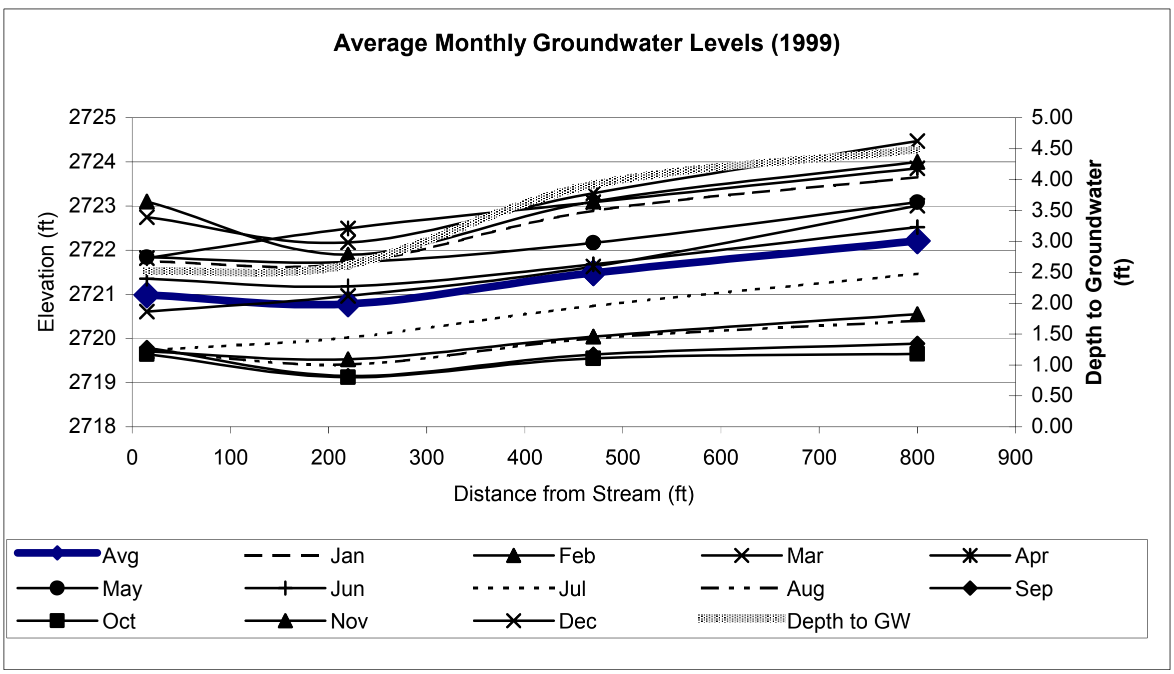

Figure 3.1-8. Groundwater Gradient
Groundwater Effect on Wetlands

Groundwater levels declined considerably just before and during the early portion of the growing season. During the wetlands delineation, between March 19 and May 8, 1999, groundwater levels in topographic lows, as measured from GMS1, varied from 0 to 17 inches. At the same time, groundwater levels in topographic highs, as measured from GMS4, varied from 20 to 42 inches (Figure 3.1-9). These data suggests that shallow groundwater contributes to wetland hydrology early in the growing season in topographic lows, including swales, depressions, and oxbows.

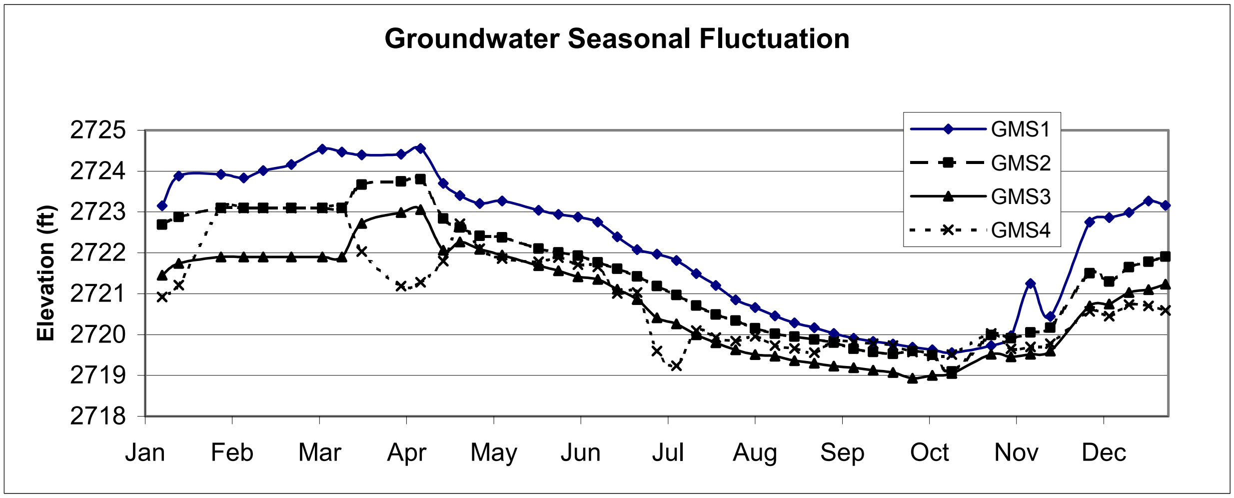

Figure 3.1-9. Groundwater Fluctuations as Measured at the Four Monitoring Wells

3.1.2 Environmental Consequences

This section focuses on potential impacts to water resources including water quality, hydrology, groundwater, river morphology, and floodplains that may result from the project alternatives. Garnet mining activities that could affect water resources include construction and operation of wet and dry panels, construction of sedimentation berms and other BMPs adjacent to the floodplain, construction and operation of haul roads, accidental spills, and water demands and releases associated with mining operations. Specifically, this section assesses the potential impacts as they relate to the following indicators: 1) water withdrawals and releases, 2) sedimentation and erosion, 3) floodplain alteration, and 4) accidental spills.

3.1.2.1 Alternative 1 - No Action

Under the No Action alternative, mining activities would continue on 77.8 acres in the upland areas adjacent to the St. Maries River. Impacts of continued mining of already permitted uplands are likely to be similar to the impacts of mining under the action alternatives. Impacts from continued mining of upland would occur regardless of which alternative is selected.

3.1.2.2 Impacts Common to All Alternatives

This section describes potential impacts common to all the alternatives, regardless of mining methodology or acreages of wetland impacts. Most of the potential impacts identified in this section would be reduced or eliminated by implementation of BMPs and pre-flood shutdown criteria.

Water Withdrawals and Releases

All action alternatives employ wet panel mining in whole or in part. Once a wet panel is opened or excavated, it must be filled with water. Initially, water must be pumped from the St. Maries River to fill the wet panels when mining operations begin. After the initial wet panels are filled, recycled water is used for each subsequent panel, and supplemented by additional water withdrawals as needed during the summer months.

Filling of the initial wet panels would require up to 288,000 cubic feet of water per wash plant (the wash plants would sit adjacent to the wet panels). ECG would utilize a maximum of three wash plants in any given year within the proposed mining areas. The total volume required is dependent upon the actual mining start-up date and the amount of groundwater present in the bottom of the excavated panels. Additionally, up to 100,000 cubic feet of water per washer may be necessary to counter the effects of infiltration and evaporation during the warmest months of July, August, and September. The total annual water withdrawal from the St. Maries River would therefore range from 588,000 cubic feet to 1,764,000 cubic feet, dependent upon whether the minimum or maximum number of washers are employed in a given mining year (ECG 2002).

Direct discharge of process waters to the St. Maries River and its tributaries would not occur as a result of the proposed garnet mining under any alternative. ECG would implement stormwater control BMPs within the mining units to prevent discharge of storm and process waters associated with mining operations (refer to Volume II Appendix A). If a significant volume of water accumulates within the BMP berms, a 5,000-gallon water tank would be utilized to pump the water out of the BMPs to prevent overtopping. Water pumped from the berms would be land applied in upland areas so that surface waters would not be impacted.

The majority of the BMPs would be designed to handle up to the 25-year storm event. The corresponding 25-year peak storm flows associated with the total project area (327.5 acres) vary slightly for each alternative dependent upon the amount of disturbed land and range from 508 cfs to 535 cfs. This represents an increase of approximately 70 to 100 cfs over the baseline condition found within the project site. In the event the St. Maries watershed experiences a flood in excess of the 25-year event during the life of the project, the project site BMPs would be overtopped and unattenuated flows would reach the St. Maries River. However, given the high flows associated with the St. Maries River for the 25-year and greater events, incremental flows associated with the project site would account for only 5 percent to 8 percent of the total flow, dependent upon the size of the storm event. Because of the differences in time to peak runoff between the project site and the St. Maries River itself, it is most likely that the peak flows from the site would occur much earlier than the peak flow in the river. Therefore, overtopping of site BMPs for storms in excess of the 25-year event would likely produce an insignificant hydrologic impact.

As with any human-made structure, there is a small but inherent risk associated with the failure of the BMPs and the mining unit berms (1.5 feet high around perimeter of mining units). To characterize the impact of failure on the receiving stream, a failure analysis was performed on the berm itself (see Volume II Appendix E). Mining unit berms were chosen as the subject of the failure analysis because they are constructed with topsoil and are therefore subject to possible sloughing. Additionally, because the mining unit berms and the associated mining units represent the single largest impoundment within the project area, as compared to other impoundments such as sedimentation basins, the failure of a mining unit berm would represent a worst-case scenario. A situation where a failure could occur would be after a large storm event that fills the mining units with water. After the flow in the St. Maries River has receded and the mining units remain completely full of water, failure of the berm could occur.

Based on the geometry of the mining panels and the associated sedimentation berm, a breach in the berm wall would result in an instantaneous peak flow discharge of approximately 150 cfs (see Volume II Appendix E). During periods of baseflow or average annual monthly flow, such a breach would not cause downstream flooding because there would be very little or no uncontrolled water within the mining unit. However, should such a breach occur during a two-year flood event or greater, downstream flooding could be exacerbated if the peak flows occurred simultaneously. Given the fact that peak runoff rates within the project area are realized within 0.35 hours, as compared to 6.94 hours for the St. Maries River itself, compounding peaks are very unlikely.

ECG's consumptive water use would be covered under a Water Appropriations Permit, granted by the Idaho Department of Water Resources (IDWR), and would allow ECG to withdraw 0.20 cfs from the St. Maries River. It is estimated that 0.20 cfs would be required to fill the wet panels in the spring and that an additional 0.04 cfs, on the average, would be required during the summer months (July, August, and September) to make up for infiltration and evaporation. Based on the average monthly flows for the St. Maries River (refer to Figure 3.1-3), a 0.20 cfs withdrawal in the spring and a 0.04 cfs withdrawal in the summer would reduce instream flows by 0.4 percent and 0.6 percent, respectively. This withdrawal would result in an insignificant impact to the hydrologic regime of the St. Maries River. Furthermore, the St. Maries River watershed is one of the few remaining watersheds in Idaho that is not stressed by agricultural, industrial, or municipal water usage. There are no significant consumptive uses within the region and mining activities have not substantially affected water supply in the St. Maries River watershed (personal communication, Ondrecan 2002).

Sedimentation and Erosion

The construction of temporary and haul roads, project site BMPs, and BMP/mining panel failures all have the potential to generate sediment and cause water quality impacts through sedimentation of the St. Maries River. Based on 34 years of record data, storm events in excess of the 25-year event have historically occurred within a three-week period between January 15 and February 11 (see Figure 3.1-10). In any given year, the probability of occurrence of a 25-year or greater event is 4 percent or less, so the potential for sedimentation of the St. Maries River associated with the overtopping of BMPs is low. In addition, sedimentation would be controlled for each alternative through the use of sedimentation basins and other BMPs such as silt fencing, straw bales, and vegetated filter strips.

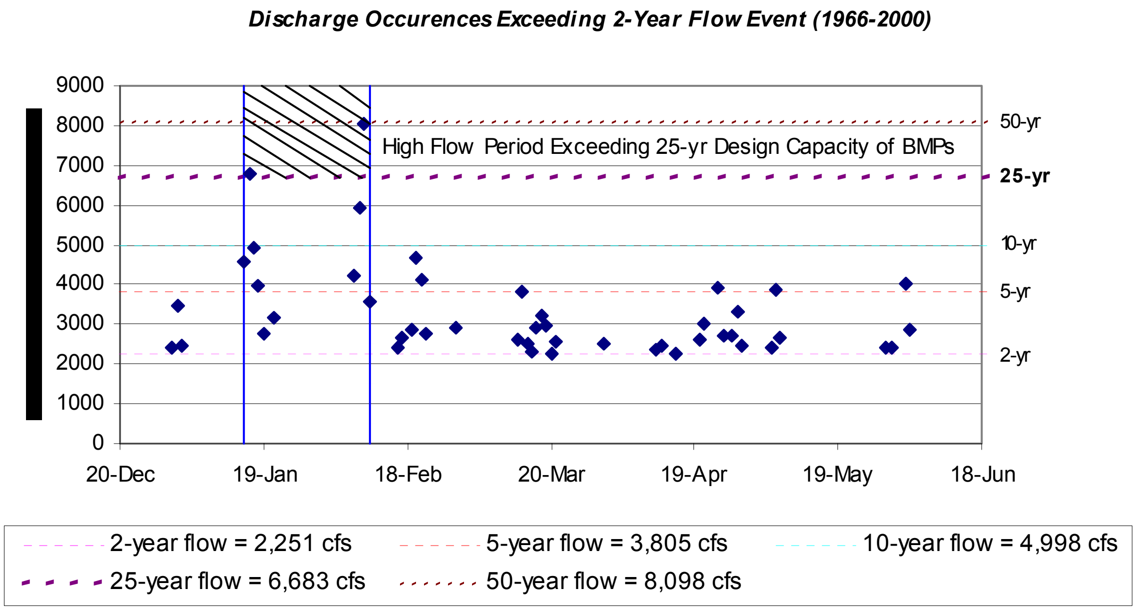

Figure 3.1-10. Flood Exceedence Chart

As was described in the previous section, there is a small but inherent risk associated with the failure of the BMPs and the mining unit berms. Should such a failure occur, sediment-laden water would be discharged into the St. Maries River. If a breach or failure were to occur during periods of low flow, State of Idaho water quality standards for turbidity would likely be violated (Idaho Administrative Procedures Act [IDAPA] 58.01.02). Idaho's turbidity standard dictates that an instantaneous reading higher than 50 Nephelometric Turbidity Units (NTU) above baseline conditions cannot be incurred. If a breach or failure were to occur during periods of high flow, the potential for impact would be greatly reduced, as the St. Maries River would already be highly turbid. A National Pollutant Discharge Elimination System (NPDES) stormwater discharge permit would be obtained to address these stormwater discharges.

It was initially thought that groundwater mounding, as a result of water-laden mining panels, would contribute to sedimentation within the St. Maries River as a result of particle "jetting" through the gravels underlying the mining panels. An analysis of groundwater velocities due to mounding concluded that the resulting velocities would be so low (approximately 100,000 times less than the St. Maries River baseflow velocity) that any coincidental sediment transport as a result of groundwater mounding would be insignificant at most. Volume II Appendix E provides additional detail on the analysis.

Significant impact to channel morphology is not expected as a result of the mining operations. This is because peak flows from the project area would be minimized through the use of BMPs for up to, and including, the 25-year storm event. During periods of high flow in excess of the 25-year event, the St. Maries River would have naturally high levels of suspended sediment and bedload coupled with high in-stream velocities and bed and bank shear stresses. The relative morphological impact of increased storm flows from within the project site would therefore be negligible. Furthermore, ECG would maintain a mining setback of 30 feet at all times and would not impact riparian vegetation crucial to streambank stability.

Floodplain Alteration

Sedimentation berms would be constructed around the mining panels to contain process waters and stormwater runoff from within the panels and would be placed 22.5 feet from the Ordinary High Water Mark (OHWM) of the St. Maries River. A hydraulic analysis was performed on the St. Maries River (see Volume II Appendix E) to determine the effects of the 18-inch-high sedimentation berms on the St. Maries River floodplain. While the berms would not affect the water surface elevation within the river (i.e., water surface elevations do not increase), the berms would prevent all flows up to and including the five-year event from reaching the floodplain. Although this impact would be localized to floodplain areas immediately behind a sedimentation berm, the resultant localized impact could be significant though its duration would be brief.

Accidental Spills

Accidental spills associated with mining operation equipment could occur. Section 3.8 provides a detailed discussion of the expected volume and frequency of transportation traffic and section 3.13 describes the hazardous materials the transportation traffic may be carrying in addition to other hazardous materials stored on site. Accidental releases could involve fuels, oils and lubricants used for mining equipment operation and maintenance. With the exception of petroleum-based fuels present in equipment tanks, all other hazardous materials would be stored at ECG's warehouse and service shop buildings.

3.1.3 Mitigation

3.1.3.1 During Mining

Sedimentation and Erosion

ECG would develop a Mining Management Team, comprising the Operations Manager, the Field Foreman, and the Environmental Specialist, to insure proper BMP construction, operation, and maintenance. BMPs would be inspected during weekly operations throughout the life of the project. ECG also would monitor mining panels for integrity of the panel walls. If sloughing is observed, ECG would instigate emergency shoring/stabilization procedures to prevent or minimize the chance of a panel wall failure.

As was described in the previous section, there is a small but inherent risk associated with the failure of the BMPs and the mining unit berms. Should such failure occur, sediment-laden water would be discharged into the St. Maries River. IF a breach of failure were to occur during periods of low flow, State of Idaho water quality standards for tubidity would likely be violated (IDAPA 58.01.02). Idaho's turbidity standard dictates that an instantaneous reading higher than 50 Nephelometric Turbidity Units (NTU) above baseline conditions cannot be incurred. If a breach or failure were to occur during periods of high flow, the potential for impact would be greatly reduced, as the St. Maries River would already be highly turbid. As noted previously, stormwater discharges would be covered under a stormwater NPDES permit.

ECG was covered under a NPDES General Permit for industrial stormwater discharges from1998 until 2000. Prior to implementing the proposed action, ECG will have to develop and implement stormwater pollution prevention plans and to obtain permit coverage from USEPA Region 10 for discharges of stormwater from the operation. Discharges from haul roads, overburden stockpiles, and berms will have to be covered under the USEPA's Construction General Permit (permit number IDR100000). Discharges from mining operations (principally, discharges from ditches that prevent stormwater from running onto the site, plus discharges from extreme storm events, will be covered under USEPA's NPDES Multi-Sector General Permit for Storm Water Discharges Associated with Industrial Activities (known as MSGP-2000), Sector J (Mineral Mining and Dressing). To qualify for coverage under each of these permits will require ECG to comply with the IDEQ's TMDL for the St. Maries River.

Floodplain Alteration

Localized hydrologic impacts to wetlands and groundwater levels associated with the construction of sedimentation berms can be mitigated through ECG's reclamation procedures. After annual mining is concluded, ECG would leave the sedimentation berms in place through the first winter to provide additional protection from sedimentation and erosion. The berms would be removed during the following spring, allowing frequent flood events once again to reach the localized wetlands and provide localized groundwater recharge.

Accidental Spills

The potential impacts of accidental spills from mining equipment would be mitigated through enforcement of ECG's equipment maintenance plan. As part of ECG's daily operations, all equipment used in the extraction, processing, and hauling of the garnet ore is serviced to insure proper operation. Absorbent materials are provided on-site as well as in the service vehicles to provide immediate spill containment and collection should an accidental spill occur. ECG's Plan of Operations provides additional detail (ECG 2002).

Additionally, ECG would instigate pre-flood shutdown criteria in the event that a flood event is forecast for the area. When operating under the pre-flood shutdown criteria procedures, ECG would mobilize equipment and personnel so that the operation and storage of equipment within the floodplain would be temporarily suspended. This would insure that mining equipment and associated fuels, lubricants, and other hazardous materials would not come in contact with stream flows during a flood event. ECG requires four hours to fully enact these procedures but, as a precautionary measure, ECG would begin mobilization eight hours in advance of a forecasted flood. This would allow ECG ample time for mobilization as the St. Maries flood peak would not reach the project site until approximately seven hours after the storm event (see Volume II Appendix E for supporting calculations).

3.1.3.2 Post-Mining

Reclamation BMPs

Management of surface water runoff following active mining would focus on containment of storm waters within the mining unit, and on trapping sediments and abating flood water velocities during spring high flows and flood flows. The silt berms and interceptor or diversion channels kept in place through the first winter and subsequent high flow would be used as reclamation BMPs. They would be used during the wet season to prevent storm waters and seasonal run-off from leaving the regraded mining unit once mining has been completed.

At the conclusion of mining, each floodplain mining unit would be regraded and have sediment fencing, hay bales, and large woody debris (LWD) staggered throughout the mining unit, perpendicular to the direction of flow of floodwaters. These BMPs would act to slow floodflows, trap sediments, and minimize the loss of stockpiled topsoil and the fine earth fraction.

All mining and reclamation BMPs would be removed the first summer after mining when topsoil is respread and the mining unit has been seeded. Removal of BMPs at this time would allow early re-establishment of surface hydrology to wetlands and the floodplain.

By implementing the design criteria described in the Plan of Operations (ECG 2002), the only time surface water runoff from areas adjacent to or within the mining unit would have an impact on the stream is when an extreme storm event that exceeds design criteria generates runoff that could cause a channel, culvert, or berm to fail. To minimize the potential for BMP failure, a surface water management team would be established by ECG to insure proper BMP construction, to inspect BMP integrity, and to specify maintenance requirements. The team would be composed of the Operations Manager, the Field Foreman, and the Company Environmental Specialist. The team would complete, or supervise completion of the following elements:

BMP Implementation. The Field Foreman would have a working knowledge of the Idaho State BMP Manual for mining. The Foreman would determine the best location for all BMPs and would supervise/monitor their construction. Upon completion of construction, the Foreman would inspect and notify the Operations Manager that all BMPs have been constructed in accordance with approved designs, measures, and State of Idaho requirements. The Operations Manager would be responsible for notifying the United States Army Corps of Engineers (USACE), in annual reports, that BMPs have been constructed properly.

BMP Maintenance and Monitoring. Maintenance of culverts, sediment traps, and settling and dispersion basins would be completed in the spring and fall, and following major storm events under supervision of the Field Foreman. All BMPs in active mining areas would be inspected weekly and following all increased run-off periods by the Environmental Specialist. The Environmental Specialist would notify the Field Foreman of any deterioration of BMPs. The Field Foreman would be responsible for ordering all repairs to BMPs, and for certifying that the repairs have been completed. A record of BMP monitoring and repairs would be kept on file by ECG for all mining areas.

Water Quality Monitoring Plan

As part of the mining operation along the St. Maries River, ECG would initiate a Water Quality Monitoring Plan. The plan has five purposes: 1) to establish a water quality baseline for the project area section of the river; 2) to determine if mining activities are impacting water quality in the river; 3) to continually evaluate current mining procedures and implementation of BMPs; 4) to change operations, if necessary, to eliminate water quality problems; and 5) to comply with the NPDES stormwater permits.

Three monitoring sites would be selected along the St. Maries River. One would be a permanent site immediately above the proposed permit areas, near the confluence of Emerald Creek. The second site would be a permanent site immediately below the proposed mining areas, near the confluence of Carpenter Creek. The third monitoring unit would be a portable device that would be located in the river immediately adjacent to an active mining unit. This site would move annually with each new mining unit.

The three monitoring sites would collect data on turbidity. This data would be collected at the two permanent sites prior to any mining to provide a background or baseline level from which to assess the potential contribution from mining activities. The data would be collected, analyzed, kept for review in ECG's office.

3.2 Wetlands

Wetlands are transitional zones between terrestrial and aquatic habitats. As described in the 1987 *Corps of Engineers Wetlands Delineation Manual,* wetlands are defined as those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas (USACE 1987). The ROI used to determine direct wetland impacts is the project area. For indirect impacts, the ROI includes wetlands adjacent and downgradient of the project site.

3.2.1 Affected Environment

Through their administration of Section 404 of the Clean Water Act (CWA), the USACE has jurisdiction over all waters of the United States (U.S.), of which wetlands are one type, and rivers and streams, such as the St. Maries River, are another. In compliance with Section 404 and Executive Order (EO) 11900, *Protection of Wetlands*, wetland surveys were performed during the growing seasons of 1996 and 1998 (Selkirk Environmental 2002a). The intermediate wetland delineation methodology, as described in the 1987 USACE's *Wetlands Delineation Manual* (USACE 1987) was used. Wetlands were delineated using the simultaneous occurrence of three criteria: occurrence of at least fifty-percent hydrophytic vegetation, wetland hydrology, and hydric soils. Wetlands identified within the ROI are depicted in Figure 3.2-1. The report entitled *Wetland Delineation for St. Maries River Study Areas* (Selkirk Environmental 2002a) was used as the primary source of information for this section of the DEIS. The findings of this report are summarized in this section to describe the baseline conditions of wetland resources within the ROI. The complete report is contained in Volume II Appendix B.

ECG has received concurrence from the USACE on jurisdictional determination and the wetland delineations (refer to Volume II Appendix K).

3.2.1.1 Baseline Surveys

Wetland Vegetation

Within the ROI, wetlands occur in the form of emergent wetlands, Hawthorne or dogwood shrublands, and cottonwood forests. Hydrophytic vegetation was determined present if the following plant associations were identified (Selkirk Environmental 2002a):

- Foxtail-Canarygrass Association (*Alopecurus pratensis - Phalaris arundinacea*)
- Sedge-Water Plantain Association (*Carex spp.-Alisma plantago-aquatilis*)

- Cattail-Sedge Association (*Typha latifolia-Carex spp.*)
- Hawthorne-Canarygrass Association (*Crataegus douglasii Phalaris arundinacea*)
- Dogwood-Sedge Association (*Cornus sericea-Carex spp.*)
- Cottonwood-Snowberry-Canarygrass Association (*Populus balsamifera-Symphocarpus albus-Phalaris arundinacea*)

Other plant associations, such as the Foxtail-Fescue Association (*Alopecurus pratensis/Festuca rubra*), required more detailed examination to determine their wetland status. Determinations of hydrophytic vegetation indicator status are based on Reed (1988) and the *1993 Supplement to National List of Plant Species that Occur in Wetlands: Northwest (Region 9)* (Stetz 1994).

Wetland Hydrology

A site is generally considered to exhibit wetland hydrology if soil saturation occurs continuously for a minimum of five percent of the growing season within the upper 12 inches of the soil profile (USACE 1987). Within the project area, the minimum number of consecutive days required for wetland hydrology is six days (Selkirk Environmental 2002a). Wetland hydrology was determined through direct observation of saturation or ponding for 5 percent of the growing season (Selkirk Environmental 2002a). Sources of wetland hydrology within the ROI include flooding, normal high flows in the St. Maries River, precipitation, and seasonally high groundwater. Flooding typically occurs during January and February when rain-on-snow events are common and act to recharge depressional areas (e.g., oxbows, truncated depressions) within the floodplain. Normal high flows in the St. Maries River typically occur from March through early June and provide wetland hydrology to high flow channel areas. Precipitation from storm events provides wetland hydrology to shallow depressions in the floodplain that are isolated from flood events, and normal high flows. Shallow groundwater likely contributes to wetland hydrology primarily early in the growing season in depressional areas. All four sources of water interact and have created the complex matrix of hydrologic regimes (i.e., saturated, seasonally flooded, semi-permanently flooded, etc.) observed within the ROI (Selkirk Environmental 2002a).

Wetland Soils

Soil pits were excavated on-site to a depth ranging from 15 to 20 inches, and soil horizons were described by thickness, texture, and color (Selkirk Environmental 2002a). Hydric soils were determined to be present where long-term ponding was observed, and where evidence of reducing conditions (i.e., anaerobic) were observed below the root zone (Selkirk Environmental 2002a). Three soil types were identified within the ROI by the Natural Resources Conservation Service (NRCS) (NRCS 2001). These soil types are: Pokey-Typic Fluvaquents complex, 0 to 4 percent slopes; Clarkia ashy silt loam, 0 to 2 percent slopes; and Reggear ashy silt loam, 3 to 20 percent slopes.

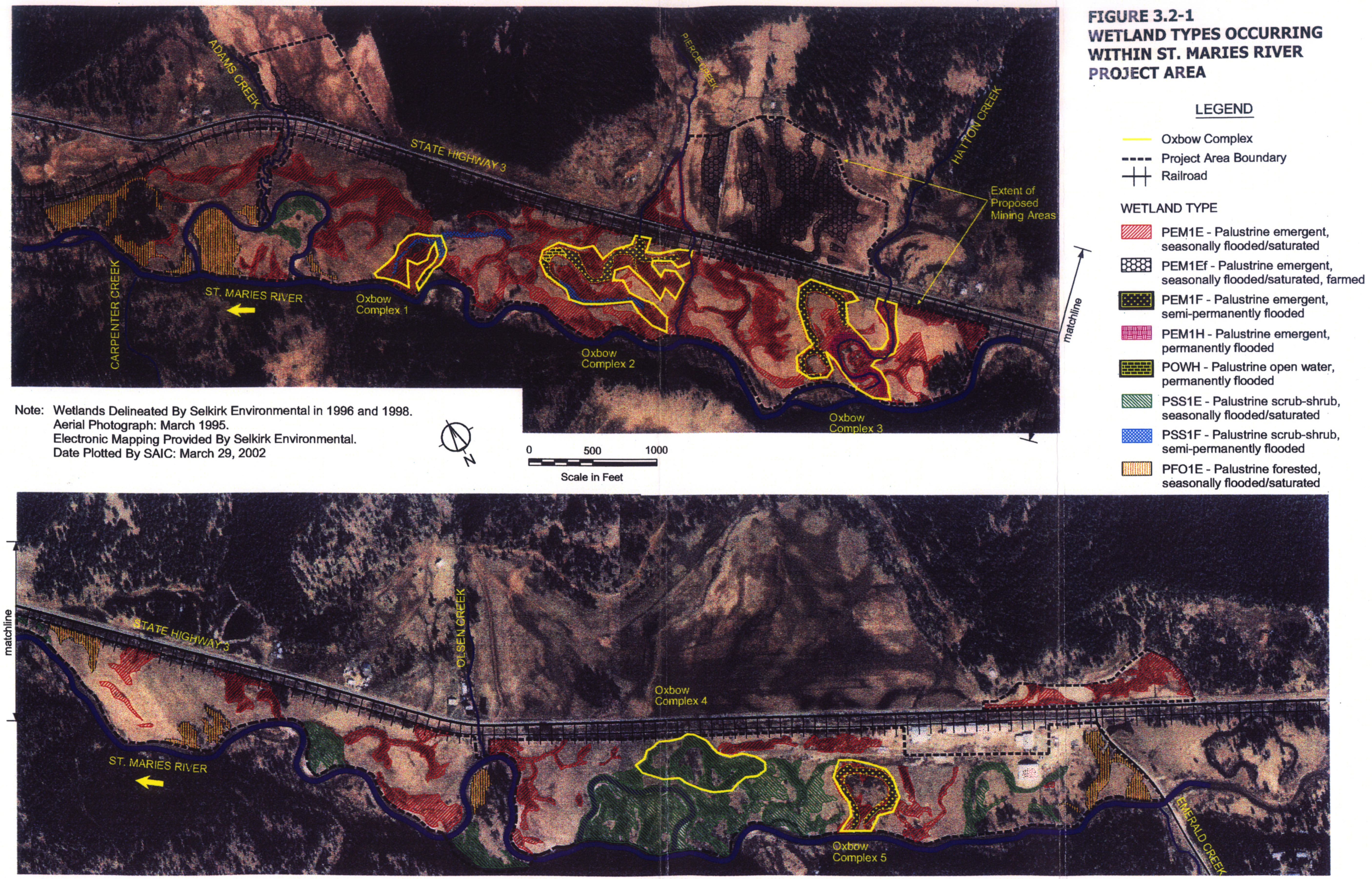

**FIGURE 3.2-1
WETLAND TYPES OCCURRING WITHIN ST. MARIES RIVER PROJECT AREA**

Of these three types, the Pokey-Typic Fluvaquents complex and the Clarkia ashy silt loam are the most common within the ROI. Pokey, Clarkia, and Reggear soil types are all considered to be non-hydric soils (NRCS 1995). However, hydric inclusions can be found in the Pokey-Typic fluvaquents complex and the Clarkia ashy silt loam soil types (Selkirk Environmental 2002a).

Pokey soils are very deep, somewhat poorly drained, have slow runoff, with moderate permeability. They formed on low stream terraces and floodplains in alluvium of mixed sources and are subject to periodic flooding between February and May (NRCS 2001). Typic fluvaquents are very poorly drained soils that were formed in mixed alluvium in depressions and channels of floodplains and on low stream terraces. Permeability is moderate in the upper 37 inches, and very rapid below 37 inches. A seasonally high water table from 0 to 18 inches is present from February through June (Selkirk Environmental 2002a).

Clarkia soils are very deep, poorly drained, have slow runoff, and have moderately slow permeability. They formed on floodplains, valley floors and narrow valley bottoms, and on low stream terraces in alluvium of mixed sources and are frequently flooded between February and May (NRCS 2001).

Reggear soils are moderately deep to an underlying fragipan, moderately well drained, and have medium to rapid runoff. Permeability is very slow in the fragipan. A perched water table is typically present and generally occurs at a depth of 22 to 28 inches. Reggear soils formed in a thin mantle of mixed volcanic ash over loess and reworked loess on basalt plateaus and hills (NRCS 2001).

Wetland Descriptions

Wetlands are classified in accordance with the Cowardin et al. (1979) classification system, as adapted by the National Wetland Inventory (NWI) (United States Fish and Wildlife Service [USFWS] 1993). Palustrine and riverine wetlands are the only classes of wetlands that occur in the ROI (USFWS 1987). Palustrine wetlands occur in the form of open water, emergent wetlands, Hawthorne or dogwood shrublands, and cottonwood forests (Selkirk Environmental 2002a). Riverine wetlands are limited to the unconsolidated channel bottoms of the St. Maries River and its tributaries. Selkirk (2002a) did not identify any riverine wetlands in the project area. General descriptions and areal extent of the palustrine wetland types in the project area are provided in Table 3.2-1.

Table 3.2-1. Summary of All Palustrine Wetland Areas in Project Area Based on Wetland Type

Palustrine Wetland Type	*Area (acres)*
POWH – Palustrine open water, permanently flooded	0.5
PEM1E – Palustrine emergent, seasonally flooded/saturated	50.2
PEM1Ef – Palustrine emergent, seasonally flooded/saturated, farmed	22.0
PEM1F – Palustrine emergent, semi-permanently flooded	4.4
PEM1H – Palustrine emergent, permanently flooded	2.2
PSS1E – Palustrine scrub-shrub, seasonally flooded/saturated	33.2
PSS1F – Palustrine scrub-shrub, semi-permanently flooded	2.9
PFO1E – Palustrine forested, seasonally flooded/saturated	17.6
TOTAL	**133.0**

Source: Selkirk Environmental 2002a.

POWH wetlands are the smallest wetland component found in the study area, totaling 0.5 acres (0.4 percent). These areas are typically inundated with over 48 inches of water and are unvegetated (Selkirk Environmental 2002a).

PEM1E wetlands comprise 37.7 percent (50.2 acres) of the total wetland area and are the most prominent wetland type in the project area. Plant associations found in this wetland type include the Foxtail-Fescue and Foxtail-Canarygrass Associations. The Foxtail-Fescue association occurs in shallow depressions and swales that typically receive 1 to 12 inches of inundation in the spring and early summer. The Foxtail-Canarygrass Association occurs in deeper depressions and swales where inundation ranges from 6 to 18 inches deep in the spring and early summer (Selkirk Environmental 2002a).

PEM1Ef wetlands are the second most prominent wetland type in the project area, and comprise a total of 22.0 acres, or 16.5 percent of the total wetland. The Foxtail-Fescue plant association is found in the farmed wetland type (Selkirk Environmental 2002a).

PEM1F wetlands total 4.4 acres within the project area, and 3.3 percent of the total wetland area. This wetland type is dominated by the Sedge-Water Plantain Association and is found in deeper swales and oxbows, where the land is typically inundated for the majority of the growing season (Selkirk Environmental 2002a).

PEM1H wetlands are dominated by the Cattail-Sedge Association and comprise 1.7 percent (2.2 acres) of the total wetland area. Depth of inundation rages from 24 to 48 inches in these communities (Selkirk Environmental 2002a).

Totaling 33.2 acres, and comprising 25 percent of the total wetland area, the PSS1E wetland type is a prominent feature within the project area. The Hawthorne-Canarygrass Association is most representative of this wetland type, and occurs in shallow depressions and other areas where inundation ranges from 0 to 12 inches in depth in the spring and early summer (Selkirk Environmental 2002a).

PSS1F is the second type of scrub-shrub wetland type found within the project area. This wetland type occupies only 2.9 acres, or 2.2 percent of the total wetland area, and is dominated by the Dogwood-Sedge Association. This plant association occurs in areas such as swales, oxbow edges, and river margins where inundation typically ranges from 6 to 24 inches in depth and persists well into mid-summer (Selkirk Environmental 2002a).

The PFO1E wetland type is the only forested wetland type found within the project area, and totals 17.6 acres in size, or 13.4 percent of the total wetland area. PFO1E wetlands are represented by the Cottonwood-Snowberry-Canarygrass Association, and are found in areas where inundation ranges from 0 to 12 inches in depth in the spring and early summer months (Selkirk Environmental 2002a).

Five oxbow complexes, totaling 32.8 acres (Table 3.2-2), occur within the project area (refer to Figure 3.2-1). These five oxbow complexes represent the highest value wetland components within the project area. Each oxbow complex represents a mosaic of habitat types including upland, open water, emergent, scrub-shrub, and forested habitat types.

Table 3.2-2. Oxbow Complexes Within the Project Area

Oxbow Complex	*Habitat Types in Complex*	*Acreage*	*Buffer (Safety Zone)*	*Total Acreage*
1	UPL, EM, SS, OW	2.8	3.8	6.6
2	UPL, EM, SS, OW	9.4	11.2	20.6
3	UPL, EM, SS, FO, OW	9.5	7.9	17.4
4	UPL, EM, SS	6.8	4.7	11.5
5	UPL, EM, SS	4.3	3.7	8.0
TOTAL		**32.8**	**31.3**	**64.1**

UPL = upland; EM = emergent; SS = scrub-shrub; FO = forested; OW = open water

3.2.1.2 Wetlands Descriptions/Functions and Values

The specific functions a wetland provides, and the degree to which it performs those functions, depends on a number of interrelated factors including the wetland type, size, plant community and species diversity, and topographic location of the wetland. A qualitative assessment of wetland functions was performed for the following functions: (1) shoreline protection, (2) hydrologic support, (3) storm/flood water abatement, (4) groundwater exchange, (5) water quality improvement, (6) natural biological support (Selkirk Environmental 2002a). These functions were individually rated as low, moderate, or high for each wetland area.

Selkirk Environmental (2002a) has indicated that wetlands within the project area are constrained from having maximum values since they are not tidal, are not near any point discharge, are not urban, and have an impermeable substrate. However, the wetland complex has significant value by providing: (1) hydrologic support to the base flow of the St. Maries River; (2) flood abatement/ storage to downstream homes and towns; (3) a sink for upstream sources of sediment; and (4) wildlife habitat (Selkirk Environmental 2002a). Within the wetland complex, areas of lower functionality occur in areas that were previously farmed due to the dominance of seeded pasture grasses, short-term hydrology, and lack of woody vegetation. Areas of higher functionality, such as oxbow complexes, occur where shallow and deep emergent wetland habitats are interlaced with shrub or tree dominated habitats, as well as in areas where different hydrologic regimes exist in close proximity to one another (Selkirk Environmental 2002a). Among the five oxbow complexes, their relative ranking from highest value to lowest value is 2, 3, 1, 4, 5 (refer to Table 2-1).

3.2.1.3 Past Activities in Wetland Areas

The St. Maries riparian system is a product of historic and on-going anthropogenic processes including fires, fire suppression, clearing, grazing and other agricultural activities, and logging. Most of these processes are long-standing and influential. For example, aerial photographs from 1955 indicate that range and/or farming improvement practices converted large portions of the floodplain from native vegetation to seeded fields.. Open range laws have encouraged cattle grazing of riparian corridors. Cattle grazing during the summer and fall months has occurred annually for more than 50 years. Extensive logging occurred between 1880 and 1935, including salvage logging after the 1910 fires. Salvage logging activities included building railways through the floodplain and building splash dams to float large volumes of logs downstream. Land clearing, grazing, other agricultural practices, and logging continue today on private property within the ROI.

3.2.2 Environmental Consequences

3.2.2.1 Alternative 1 - No Action

Under the No Action alternative, mining activities would continue on 77.8 acres of upland (non-wetland) area. In addition, under the No Action alternative, ongoing cattle grazing in the area wouldcontinue in both uplands and wetlands, including oxbows.

3.2.2.2 Impacts Common to All Alternatives

Impacts to wetlands resulting from garnet mining can potentially occur either directly as temporary or permanent filling, or as indirect impacts. A direct impact to wetland areas is unavoidable for all action alternatives. According to Selkirk Environmental (2002b), direct impacts would result due to: temporary stockpiling of topsoil in wetland habitats; temporary placement of fill in wetlands for roads, equipment pads, and siltation berms; and dredged material sidecast into wetland areas in the construction of diversion channels and sediment basins. Direct impacts to wetlands are summarized in Table 3.2-3. All impacts calculations were based on data provided by Selkirk Environmental (Selkirk Environmental 2000). For all alternatives, direct impacts would be mitigated or otherwise compensated through reclamation and mitigation activities described in the Plan of Operations.

Table 3.2-3. Total Direct Impacts to Wetland Types by Alternative

Wetland Type	DIRECT IMPACT AREA BY ALTERNATIVE (acres)					
	1	*2*	*3*	*8*	*9*	*10*
POWH	0	0.50	0.50	0	0	0.20
PEM1E	0	50.20	50.20	28.65	32.50	38.50
PEM1Ef	0	22.00	22.00	22.00	22.00	22.00
PEM1F	0	4.40	4.40	0	1.80	4.00
PEM1H	0	2.20	2.20	0	0	2.20
PSS1E	0	33.20	33.20	19.10	24.30	23.30
PSS1F	0	2.90	2.90	0.75	1.85	1.10
PFO1E	0	17.60	17.60	14.10	14.10	17.60
Total Direct Impacts	**0**	**133.00**	**133.00**	**84.30**	**96.90**	**108.90**
Total Direct Impacts as a Percentage of Total Wetlands (133.0 acres)	**0**	**100%**	**100%**	**63%**	**73%**	**82%**

Source: Selkirk Environmental 2000.

Wetland impacts through mining activities would occur over a 9 to 15 year period and be limited to 20 to 25 acres of impact per year (Selkirk Environmental 2000). As mining ceases at one panel and is moved to the next panel, reclamation activities would commence on the mined panel area, and impacts would begin in the unmined panel area. In this way, both impacts and reclamation would be occurring concurrently throughout the life of the project.

For each alternative, direct impacts to wetlands were analyzed using the following criteria:

1. Acres of direct impacts to wetland types.

2. Acres of direct wetland impact in oxbows.

3. Percentage of acres of direct impact relative to total wetland acreage.

4. Indirect wetland impact.

Potential indirect impacts to wetlands considered for Alternatives 2, 3, 8, 9, 10 include: alteration of wetland hydrology from changes in drainage patterns, changes in runoff volumes, and/or changes to local alluvial groundwater flow gradients; and increased delivery of nonpoint source (NPS) pollution to adjacent wetland areas, such as temporary increases in sediment loads from land clearing activities, seasonal pulses of sediment and salt from winter road maintenance, and petroleum distillates, metals, and rubber contained in stormwater from ordinary machinery wear.

The use of BMPs such as seeding, mulching, diversion ditches, and sediment basins would minimize runoff and sediment volumes leaving the site. Implementation of standard BMPs that minimize nonpoint source pollution would minimize potential secondary impacts to wetlands outside the project area.

3.2.2.3 Impacts Unique to Specific Alternatives

Alternatives 2 and 3

Alternatives 2 and 3 would affect 133 acres (100 percent) of the existing wetland area occurring within the project area, including all five of the higher quality oxbow complexes (32.8 acres), 17.6 acres of forested wetlands, and 36.1 acres of scrub-shrub wetland habitat, as well as emergent wetlands.

Alternative 8

Alternative 8 would affect 84.3 acres (63 percent) of the total wetland acreage (133.0 acres) within the permit area. Alternative 8 would reduce total wetland impact by avoiding 48.7 acres of wetland (all five oxbows complexes plus adjacent inaccessible areas). Impacts to scrub-shrub wetlands and forested wetlands are estimated to be 4.6 acres and 17.1 acres, respectively.

Alternative 9

Alternative 9 would affect 96.9 acres (73 percent) of the total wetland area (133.0 acres) within the project area. Alternative 9 avoids impacts to the three higher quality oxbow complexes (1, 2 and 3) and adjacent inaccessible areas, resulting in 36.1 acres less impact to wetlands than Alternatives 2 or

3. Of these 36.1 acres, 21.7 acres actually occur within oxbow complexes 1, 2, and 3. Impacts to scrub-shrub wetlands and forested wetlands are 4.6 acres and 17.1 acres, respectively.

Alternative 10

Alternative 10 would impact 108.9 acres (82 percent) of the total wetland area (133.0 acres) within the project area. Alternative 10 would avoid impacts to oxbow complexes 2 and 4, and adjacent inaccessible areas, resulting in 24.1 acres less impact to wetlands than Alternatives 2 or 3. Of these 24.1 acres, 16.2 acres actually occur within oxbow complexes 2 and 4. Impacts to scrub-shrub wetlands and forested wetlands are 4.6 acres and 17.6 acres, respectively.

3.2.3 Mitigation

The Memorandum of Agreement (MOA) regarding *The Determination of Mitigation Under the Clean Water Act Section 404(b)(1) Guidelines* (United States Environmental Protection Agency [USEPA] and USACE 1990) identifies three types of mitigation: avoidance, minimization, and compensatory mitigation. The MOA further states that the sequence of mitigation is to first avoid potential impacts to the "…maximum extent practicable." Unavoidable impacts are then mitigated by minimizing the potential impact and finally, by compensating for the remaining unavoidable adverse impacts. To maximize the likelihood of compensatory mitigation success, the MOA recommends "…restoration should be the first option considered."

A detailed mitigation plan would be developed and implemented as part of the CWA Section 404 permit process. Mitigation would be a condition of any subsequent 404 permit issued for this project. The mitigation plan would determine the appropriate wetland mitigation for this project based on the values and functions of the impacted resource. Following is a summary description of the three types of mitigation as they apply to the St. Maries project. For more detailed information see the report entitled *Temporary Wetland Impacts and Reclamation and Mitigation Concepts for St. Maries River Permit Areas* (Volume II Appendix D) (Selkirk Environmental 2002b).

3.2.3.1 Avoidance

Since alluvial garnets occur in floodplains, complete avoidance of impacts to wetlands is not possible for garnet mining operations. However, efforts would be made to minimize impacts to wetlands by minimizing the temporal loss of wetland resources and by minimizing the potential for indirect impacts to the St. Maries River and downgradient wetlands.

3.2.3.2 Minimization

For Alternatives 2, 3, 8, 9, and 10, actions to minimize adverse effects to the biological, chemical, and physical components of the St. Maries River and floodplain include: minimizing the temporal loss of wetland resources, and minimizing adverse indirect impacts to adjacent lands and the St. Maries River through BMPs. Details of efforts to minimize impacts to wetlands are included in the *Plan of Operation for the 12-Month Wet and Dry Panel Mining of St. Maries River Mining Areas* (ECG 2002). Copies of the Plan of Operations are on file and available for review at USACE offices in Walla Walla, Washington and Coeur d'Alene, Idaho, and USEPA, USFWS, and Idaho Department of Lands (IDL) offices in Boise, Idaho.

Despite efforts to minimize, some impacts to wetlands would occur for each action alternative. Unavoidable impacts require mitigation to offset the functional loss of special aquatic sites such as wetlands. Committed mitigation has been incorporated into the Plan of Operation for each action alternative as described in detail in Selkirk Environmental (2000). In general, wetland mitigation identified by Selkirk Environmental (2000) includes both restoration and enhancement. Reclamation of impacted wetlands would occur at a 1:1 ratio so that each acre impacted would be replaced. Enhancement includes expanding the wetland area and fencing replaced and mitigated wetlands to protect them from cattle grazing.

Minimization of Temporal Loss

Wetland functions would be restored as quickly as possible. The pre-mined acreage of open water, emergent, scrub-shrub, and forested habitats would be incrementally replaced as reclamation follows mining. Wetland areas regraded and seeded the first summer season would be planted with woody species the second summer season. Irrigation would occur as necessary to assure seed and plant establishment.

Wetland habitats and functions would be reclaimed by replacing the pre-mining plant structure and hydrologic regime. Wetland functions would be replaced at their pre-mining values, some nearly immediately, others over time. Hydrologic support and groundwater exchange functions would be replaced once wetland reconstruction has been completed. Storm/flood water storage and abatement would be nearly replaced once wetland construction has been completed. Abatement would be maximized over time with woody plant growth. Water quality improvement functions would be replaced once emergent and groundcover vegetation has been re-established. This would take approximately three growing seasons (based on past ECG experience). Natural biologic functions for aquatic organisms are replaced once wetland reconstruction has been completed and hydrologic stratification is present. The same functions for terrestrial organisms would be replaced over time as woody vegetation matures and stratifies. The woody component would likely be functional within five years of wetland re-establishment.

Oxbow complexes would be reconstructed in nearby, completed mining units before the next complexes are mined. These systems would be constructed after topsoil has been placed and groundcover established for one year. The oxbows would be excavated to pre-mining depths and configurations determined by cross sections and pre-mining aerial photography. These complexes would be inoculated with substrate from existing oxbows and planted with woody species endemic to the St. Maries basin. This process would reduce the overall recovery time and would minimize temporal losses of the most diverse wetland complexes. Oxbow complexes would be constructed, seeded, and planted with woody species during the second reclamation season.

Reclamation designs would provide additional special habitat features to augment the natural biologic functions of the reclaimed wetlands. These special features include downed logs, snags, and forested upland pockets and corridors. Downed logs provide habitat for insects, small mammals, amphibians, and gallinaceous birds. Snags provide habitat for insects, passerines, woodpeckers, and predatory birds, including raptors. Forested upland pockets and corridors provide cover opportunities, primarily for ungulates. These features would be incorporated into annual site-specific reclamation designs for forested, scrub-shrub, and deeply inundated emergent areas.

Mature trees and shrubs would be replaced as mining proceeds. ECG would plant 4,140 trees over a 20-year reclamation cycle, with an expected survival rate of 50 to 75 percent (2,070 to 3,105 trees). In addition, 6,627 shrubs would be planted over a 20-year reclamation cycle. These rates of tree and shrub re-establishment are expected to provide: a net increase in forested wetlands (at least 20 percent tree canopy) at a 1.40:1 ratio; a 5 percent tree canopy in all re-established scrub-shrub wetlands (replaced at a 1.15:1); and 16.9 acres of upland forest.

Protection of the reclaimed wetlands from grazing is provided by short- and long-term fencing. Short-term perimeter fencing would be placed around each reclaimed mining unit during the first year of reclamation. This fencing would remain in place and be maintained during a five-year monitoring period. Fencing would be removed on other private ownership once the monitoring period has ended and all performance standards have been realized (see section 6.2, Plan of Operations, ECG 2002). Short-term perimeter fencing would become long-term perimeter fencing on ECG ownership once performance standards have been realized.

Two types of long-term fencing would be employed, depending on land ownership. On ECG-owned land, long-term fencing would be accomplished by extending short-term fencing as recently mined annual units are seeded and planted. Fencing would be maintained on an annual basis as long as ECG owns the property, or until a change in land use occurs. This would provide long-term protection to approximately 106 acres of wetlands and non-wetland riparian corridor. This would protect 32 percent of the total project area once mining and reclamation have been completed. It would also protect 59.5 acres of the 162.4 acres of wetland that would be reclaimed (37 percent).

Long-term cluster fencing would be employed on other private ownership by placing fencing around all clusters of trees in annually reclaimed units. This fencing would remain in place for different lengths of time, depending upon stock size and growth rate. Cluster fencing duration would be based on the following stock size: 1 gallon cottonwood or aspen, 4 to 6 foot height (five to 10 additional years); 5 gallon cottonwood or aspen, 6 to 8 foot height (three to seven additional years); and cottonwood poles, 3" caliper, 5 feet above ground (three to five additional years).

Long-term fencing is not intended to protect planted trees until they reach maturity. Rather, it is intended to protect planted trees until they are well established with healthy root systems and crown development. New planted specimens would be protected for eight to 15 years and would be producing seed as well as root suckering providing additional trees annually. This would be adequate mitigation even if mortality from cattle or other factors occurs after the period of long-term fencing. Some mortality is beneficial in terms of creating specialized habitat features for primary and secondary decomposers as well as other members of the food chain.

Riparian enhancement plantings would be incorporated into the reclamation designs on ECG's property. The mining plan proposes a 30-foot wide mining setback along the St. Maries River. Twenty-two and a half feet of the setback adjacent to the river would not be altered. A silt berm would occupy the remaining 7.5 feet of the buffer for a two-year period. This 30-foot wide area would be planted with native shrubs, and deciduous and coniferous trees where existing woody vegetation is lacking. This would occur after mining has been completed when woody material is being planted in active reclamation areas. These riparian plantings would provide additional cover for small mammals, passerines, and ungulates; detritus for the river system; and bank stabilization with deep root structures. At maturity, the trees would decay and topple, providing downed logs at top-of-bank and LWD for the river system.

Minimization of Indirect Impacts

Indirect impacts to water quality in the St. Maries River and the surrounding landscape would be minimized through the use of BMPs, surface water management, and pre-flood shutdown criteria and procedures. Volume II Appendix A details these procedures.

Mining BMPs - Successful implementation of a mining plan for each of the specified mining areas would require the construction of specific structures, or utilization of specific construction techniques to meet erosion and non-point discharge criteria. Siltation berms would be installed around the annual mining unit to capture and contain all surface runoff within the mining unit. They would not be designed to keep river floodflows from entering the annual mining unit. Stabilization seed mix and catch basins would be used. Silt fencing and straw bales would be installed to prevent sediment from entering a specific area or body of water. Interceptor and diversion channels would be constructed upslope of the mining unit to collect overland runoff and convey it around the mining unit. Sediment basins would be constructed at the downstream end of all interceptor and diversion channels. The basins would be designed to detain runoff from 25-year, 24-hour storm events for a 0.5 square mile area. Vegetated biofilter strips would be used at the outflow of all sediment basins and adjacent to temporary roads. The vegetated biofilter strips would be 30 feet wide and be designed to slow storm waters, trap sediments, and biofilter any surface flow before it enters a stream or river.

Surface Water Management - Management of surface water runoff within each permit area would be completed by focusing activities within the active mining units. Surface water runoff within each of the proposed mining areas would be managed using the mining unit as the boundary (ECG 2002).

For each mining unit, an annual stormwater management plan would be implemented beginning with the pre-mining activities. Overland runoff within the active mining unit would occur as a result of rainfall or snowmelt within the boundary of the unit. Interceptor or diversion channels and silt berms would prevent overland flow from outside the mining unit reaching the interior portions of the mining unit. Due to the construction of the impermeable siltation berm, any overland runoff generated within the mining unit would accumulate in the mining panels or the lowest corner of the mining unit, and would be contained within the mining unit. If a large amount of water begins to accumulate along the berms, a 5,000-gallon water tank would be brought on-site to pump the water out of the mining unit and released to an upland area in a manner that would prevent entry into surface waters. The silt berms and interceptor or diversion channels would be kept in place through the first winter and subsequent high flow period to prevent storm waters and seasonal run-off from leaving the mining unit. They would be removed the first summer after mining when topsoil is re-spread and the mining unit is seeded.

Temporary roads would provide access all mining units. Culverts would be installed to convey all water under the road and prevent blockage of the channel, as necessary. Straw bales, silt fencing, and erosion control seed mixes would be used to prevent water quality degradation during culvert placement, and to stabilize all areas of disturbed soil. Haul roads would not be constructed over the siltation berms to prevent a weak or low area in the berm from being created.

A Surface Water Management Team would be established to insure proper BMP construction, to inspect BMP integrity, and to specify BMP maintenance requirements. This team would be composed of the Operations Manager, the Field Foreman, and the Company (ECG) Environmental

Specialist. They would be responsible for correct implementation of BMPs and long-term maintenance and monitoring of BMPs, as described in section 8.1, Plan of Operations (ECG 2002).

Pre-flood Shutdown Criteria and Procedures - The mining plan incorporates the following avoidance mitigation and mining operation safeguards that are intended to minimize potential flood-related impacts:

- Mining operations would not occur within the ordinary high water line (OHWL) of the St. Maries River. OHWL is defined as the edge of the wetted river channel during the annual high flow period. The annual high flow has been determined to be 724 cfs. The OHWL would be visually determined in the field by identification of the topographic position where the unvegetated channel meets the vegetated top-of-bank.
- Mining would not occur within 30 feet of OHWL.
- Wet mining panels would not be constructed within 30 to 70 feet of OHWL, depending upon the alternative.
- Permanent stream channels crossing the floodplain would not be mined.
- Mining operations would not occur when BMPs proper function is limited by excessive surface runoff.

The proposed mining timeframe is year round, as long as designed BMPs are functioning properly. The determination to temporarily suspend mining would be based on proper functioning of BMPs, and on real time storm and flood forecasting.

In order to anticipate the need for implementation of shutdown procedures, specific duties have been assigned to a Mining Management Team. This team would consist of the Operations Manager, the Field Foreman, and the Environmental Specialist. The Operations Manager would be responsible for monitoring real-time storm and flood forecasting. The Field Foreman and the Environmental Specialist would be responsible for monitoring the effective operation of BMPs, maintaining those BMPs, alerting the Operations Manager when BMPs are near or at capacity, and implementing shutdown protocol when directed. The Operations Manager would be responsible for ordering discretionary implementation of shutdown protocol when BMP conditions or forecasting information provide sufficient evidence that shutdown is necessary.

BMPs may approach capacity during adverse weather conditions before a flood is forecast, or before a flood event affects the proposed permit areas. In this case, if <u>any</u> of the following criteria are met, mining activities would be suspended until conditions change and criteria can be met.

- Interceptor and/or diversion channels are not carrying all flow around the mining unit.
- Culverts in interceptor and/or diversion channels are not passing all flow through the structures.
- Settling and dispersion basins are not collecting bedload, suspended sediment, and organic debris.

- Discharge from sediment basins is not spreading over the floodplain.
- Runoff originating from within the active mining unit is not contained within the mining unit.

In addition to temporary suspension of mining when BMPs are at capacity, mining would also be suspended when real-time storm and flood forecasting predicts a flood event. During December, January, February, and March, the Operations Manager would retrieve storm and flood forecasts at the beginning, middle, and end of each day, including weekends. Specifically, the Idaho Bureau of Disaster Services and National Oceanic and Atmospheric Administration weather forecasts and flood warning system would be accessed and monitored. If a flood forecast of any flood size is received, the Operations Manager would order a suspension of all mining activities in flood-prone areas. ECG can shut down field operations, mobilize all equipment, and relocate all equipment outside the flood-prone area in a 4-hour timeframe. As a safety margin, ECG would react in time to suspend all mining at least 8 hours before a flood is expected.

Mining would remain suspended until surface runoff and stream flow return to manageable conditions, and all BMPs are functioning within their capacities. A NPDES permit would be in place which would address an accidental release of sediment-laden water during an extreme flood event.

Under this plan, shutdown or suspension of mining means no equipment is operating in a flood-prone area, and no equipment is stored in a flood-prone area. Shutdown or suspension of mining does not mean that wet panels would be closed as part of the shutdown process. Wet panels are, at a minimum, 80 feet by 100 feet (normally 80 feet by 300 feet) in size and may take several months to close, even during the best reclamation time in the summer months. Water must be pumped out of the wet panels and the accumulated silt must be allowed to dry, before the area is firm enough to use grading equipment to close the panel. This cannot be accomplished in a short timeframe and still maintain a degree of effectiveness.

3.2.3.3 Compensatory Mitigation

ECG has developed a detailed Reclamation Plan as part of the Plan of Operations that outlines reclamation timeframes, reclamation sequencing, detailed reclamation design concepts as well as reclamation monitoring and performance standards necessary to successfully complete reclamation of the proposed mining units and permit areas. This reclamation plan is the same for all mining alternatives, however it would require modification if any options of the Oxbow Avoidance Alternative are selected. The modification would reduce the reclaimed acreage in proportion to the mitigation ratio and the land ownership. Section 5.0 of the Plan of Operations (ECG 2002) and sections 4.0 and 5.0 of the Reclamation and Mitigation Concepts Report (Volume II Appendix D) contain detailed discussions and figures and tables that relate to the following summary of proposed reclamation. The reclamation plan has the following key elements:

- Mining BMPs would remain in place through the first high flow season after mining has been completed. Siltation berms, interceptor or diversion channels, and sediment basins would be functional at this time, no panels are open, and no mining process water is present in the mining unit.

- Mining BMPs would be removed after the first high flow season during final grading to allow the normal hydrologic cycle to resume.

- Reclamation BMPs would be placed on the regraded mining unit after mining BMPs are removed, and would be maintained through a second high flow season to abate flood flows, minimize local scour, and trap sediments.

- Topsoil would be spread to final grade and the mining unit seeded the first summer season after mining is completed.

- Irrigation would occur as necessary to assure seed and plant establishment.

- Wetland areas regraded and seeded the first summer season would be planted with woody species the second summer season.

- Oxbow complexes would be recreated before they are mined.

- Oxbow complexes would be constructed, seeded, and planted with woody species the second reclamation season.

Reclamation Timeframe

Reclamation activities would be undertaken during the drier summer and fall months, when surface water is not present and groundwater levels are at their deepest. This is the optimum timeframe for reclamation as it follows closely behind the completion of mining and provides dry conditions for spreading topsoil and excavating deeper aquatic systems, including oxbows.

For each mining unit, reclamation activities are undertaken in one season in areas being reclaimed to pasture lands, and in two seasons in active floodplain areas. Pasture reclamation is completed the first summer season after mining by removing mining BMPs, respreading topsoil, seeding a pasture seed mix, and irrigating as needed. Floodplain reclamation would take two seasons to complete. During the first season, the recently mined area would be rough graded to provide upland habitats, seasonally saturated wetland habitats, and shallowly inundated wetland habitats. This would be accomplished by following annual reclamation designs and undulating the floodplain as it is rough graded. Topsoil would be spread, the area seeded, reclamation BMPs installed, and fencing installed, prior to the start of winter.

During the second season, oxbows and other deeply inundated wetland areas would be excavated. Once these areas are excavated, they would be seeded (including mucky substrate from existing oxbows that would be mined) and all of the reclaimed unit would be planted with woody material. Any reclamation BMPs moved during excavation would be relocated for the second winter. During the third season, silt fencing would be removed. Woody materials and straw bales used as reclamation BMPs would be left in place to decompose.

The reclamation timeframes have been established to minimize soil loss and potential water quality degradation. This is achieved in two ways. The first is reclaiming only during the drier summer and fall months when surface water is not present within the reclaimed units. The second is the reliance on two seasons to complete reclamation. In this manner, the regraded overburden and stockpiled topsoil is protected during high flows by mining and reclamation BMPs, regraded topsoil has an established groundcover before becoming vulnerable to the first unprotected high flow period, and oxbow construction occurs in stabilized areas that have been graded and have an established groundcover.

Reclamation Guidelines

The following reclamation guidelines would be used as a framework for reclamation design development. These include replacement and mitigation guidelines outlined in the Temporary Wetland Impacts and Reclamation and Mitigation Concepts Report (Volume II Appendix D) and in Plan of Operations (ECG 2002). Replacement guidelines are designed to offset temporary impacts to wetlands such as the temporary placement of fill associated with temporary and haul roads, topsoil and overburden stockpiles, and pads for excavators and wash plants. Mitigation guidelines are designed to offset temporal losses of wetland functions that return over time, and to provide wetland protection.

Guideline 1 (Replacement) - Reclamation of impacted wetlands would be accomplished at a 1:1 ratio on non-ECG properties (based on acreage of proposed temporary impacts). Wetland functions would be restored as quickly as possible. The pre-mined acreage of open water, emergent, scrub-shrub, and forested habitats would be incrementally replaced as reclamation follows mining. No riverine habitat would be mined, so it would not have to be reclaimed.

Guideline 2 (Mitigation) - Reclamation of impacted wetlands would be accomplished at a 1.7:1 ratio on ECG's property (based on acreage of proposed temporary impacts). Wetland functions would be restored as quickly as possible. The pre-mined acreage of open water, emergent, scrub-shrub, and forested habitats would be incrementally increased as reclamation follows mining.

Wetland habitats and functions would be reclaimed by replacing the pre-mining plant structure and hydrologic regime. Wetland functions would be replaced at their pre-mining values, some nearly immediately, others over time. Hydrologic support and groundwater exchange functions would be replaced once wetland reconstruction has been completed. Storm/flood water storage and abatement would be nearly replaced once wetland construction has been completed. Abatement would be maximized over time with woody plant growth. Water quality improvement functions would be replaced once emergent and groundcover vegetation has been re-established. This takes approximately three growing seasons from ECG's past experience. Natural biologic functions for aquatic organisms is replaced once wetland reconstruction has been completed and hydrologic stratification is present. The same functions for terrestrial organisms would be replaced over time as woody vegetation matures and stratifies. The woody component would be functional within five years of wetland re-establishment.

Guideline 3 (Replacement and mitigation) - Reclamation would proceed at a rate that would minimize impacts to surface water quality. Farmed wetlands (pasture and hay fields) would be reclaimed the first season following mining while native growth, floodplain wetlands would be reclaimed over a two-year period following mining.

Farmed wetlands are separated from the active floodplain by Highway 3 and the adjacent railroad line. These areas would have the siltation berms and interceptor/diversion channels from mining in place, as well as all topsoil/subsoil stockpiled during the first high flow season after mining. These mining BMPs would be removed the first summer season after mining, topsoil/subsoil would be replaced to final grade, and all bare ground seeded with a pasture seed mix. Since flood protection is not imperative in these areas, activities guided by this goal may be accelerated into the mining year if seeding can occur prior to September 1, allowing time for seedling establishment.

Floodplain wetlands are immediately adjacent to the St. Maries River and receive annual high flows and frequent flood flows. These areas would have siltation berms from mining remain in place, and all topsoil/subsoil remain stockpiled the first high flow season after mining. These mining BMPs would assist in trapping sediments during high flows and flood flows, but they are not designed to impede flood flows. Reclamation BMPs, including silt fencing, straw bales, and/or large woody material, would be staggered across the regraded floodplain perpendicular to the river channel. Reclamation BMPs would slow flood velocities, protect regraded overburden and stockpiled topsoil, and trap sediments. Siltation berms would be removed the first summer season after mining, topsoil and overburden would be replaced to final grade, and all bare ground seeded with various wetland and upland seed mixes. In this fashion, the replaced topsoil would have an established groundcover to protect it during typical winter and spring hydrologic patterns. Woody vegetation would be planted and oxbows would be constructed the second summer season after mining. Reclamation BMPs would be removed after the second high flow season, except for large wood that would remain as special habitat features (see Guideline 5).

Guideline 4 (Mitigation) - Six oxbow complexes were identified in the Wetland Delineation Report (Selkirk Environmental 2002a) as having scrub-shrub and forested components, and having semi-permanent or longer duration inundation. Five of these wetland complexes occur in the proposed permit areas. They would be reconstructed in nearby, completed mining units before they are mined. These systems would be constructed after topsoil has been placed and groundcover established for one year. The oxbows would be excavated to pre-mining depths and configurations determined by cross sections and pre-mining aerial photography. These complexes would be inoculated with substrate from existing oxbows and planted with woody species endemic to the St. Maries basin. This process would reduce the overall recovery time and would minimize temporal losses of the most diverse wetland complexes.

Guideline 5 (Mitigation) - Reclamation designs would provide additional special habitat features to augment the natural biologic functions of the reclaimed wetlands. These special features include downed logs, snags, and forested upland pockets and corridors. Downed logs provide habitat for insects, small mammals, amphibians, and gallinaceous birds. Snags provide habitat for insects, passerines, woodpeckers, and predatory birds, including raptors. Forested upland pockets and corridors provide cover opportunities, primarily for ungulates. These features would be incorporated into annual site-specific reclamation designs for forested, scrub-shrub, and deeply inundated emergent areas.

Guideline 6 (Mitigation) - Mature trees would be replaced as mining proceeds so that a 230+ percent gain (4140/1754=2.36) in tree population is realized over the lifetime of the mining activities. Section 1.2 of the Plan of Operations (ECG 2002) describes the tree survey, as well as the number of trees retained versus the number of trees lost to mining. Tree re-establishment at this rate would be realized by:

- providing a net increase in forested wetlands (at least 20 percent tree canopy) at a 1.40:1 ratio.

- providing a 5 percent tree canopy in all re-established scrub-shrub wetlands (replaced at a 1.15:1).
- providing 16.9 acres of upland forest.

Guideline 7 (Mitigation) - Riparian enhancement plantings would be incorporated into the reclamation designs on ECG's property. The mining plan proposes a 30-foot wide buffer along the St. Maries River. ECG has traditionally left a 30-foot setback between active mining and the stream channel based upon the State of Idaho dredge/placer mining permit (Permit Item 4). At times it has been necessary for ECG to ask IDL to reduce the setback to 15 feet in areas that are restricted for space and/or had poor reserves. Twenty-two and a half feet of the buffer adjacent to the river would not be altered. A silt berm would occupy the remaining 7.5 feet of the buffer for a two-year period. This 30-foot wide area would be planted with native shrubs, and deciduous and coniferous trees where existing woody vegetation is lacking. This would occur after mining has been completed, when woody material is being planted in active reclamation areas.

These riparian plantings would provide additional cover for small mammals, passerines, and ungulates, detritus for the river system, and bank stabilization with deep root structures. At maturity, the trees would decay and topple, providing downed logs at top-of-bank and LWD for the river system.

Guideline 8 (Mitigation) - Protection of the reclaimed wetlands from grazing would be provided by short- and long-term fencing.

Reclamation Design Criteria

Design criteria for replacement of impacted wetlands and uplands is discussed in the following sections. Design criteria include conceptual grading plans, reclaimed wetland hydrologic support, and vegetation design concepts and planting plans.

Conceptual Grading Plans - Successful wetland reclamation is key to providing adequate wetland hydrology. In the post-mining landscape, this is readily accomplished by proper regrading and excavation. In the pasture environment of Mining Areas A and E (refer to Figure 2-1), grading would be focused on creating a generally level landscape with limited seasonal inundation and saturation. In the active floodplain environments of Mining Areas B, C, and D, grading would seek to re-create a varied relief landscape featuring areas of saturation, seasonal inundation, semi-permanent inundation, and permanent inundation. Mining Area B would be regraded to create seasonal inundation and semi-permanent inundation. Grading variations of 6 inches to more than 48 inches would provide the topographic variability needed for hydrologic diversity.

Site-specific annual grading plans would be prepared for each mining unit. Annual grading plans would be based on existing topographic features of the various wetland habitats. The Plan of Operations (ECG 2000) contains surveyed cross sections of the various wetland habitats. All annual reclamation plans would be implemented during the end of the mining year, when overburden is being regraded. Grading stakes would be established with cut or fill requirements. An undisturbed wetland edge point in the buffer, or at OHWL, would become a benchmark to identify the cut or fill required at each grading stake. The result of this approach would be the re-creation of the pre-mining landscape with the goal of increasing the amount of semi-permanently and permanently flooded conditions.

Regrading during the end-of-mining each year would provide the necessary elevations for seasonally flooded/saturated and farmed wetland habitats. Excavation during the first season of reclamation would provide the necessary elevations for semi-permanently flooded and permanently flooded wetland habitats.

Reclaimed Wetland Hydrologic Support - Successful wetland reclamation is largely dependent upon restoration of sustainable hydrologic regimes. The grading plans would re-establish the pre-mining elevation changes between uplands, seasonally saturated areas, semi-permanently inundated areas, and permanently inundated areas. Hydrologic support in regraded areas would come from four sources: 1) seasonal flooding of the St. Maries River; 2) seasonally shallow groundwater associated with periods of groundwater recharge; 3) high in-channel flow; and 4) precipitation.

Vegetation Design Concepts - The principal goal of vegetation designs would be to replace the existing plant communities by seeding, planting, and transplanting most of the species present in the pre-mining state. The designs would serve as a 'blueprint,' establishing a source of plant material that would allow the post-mining landscape to be re-established as quickly as possible. Each wetland habitat, described in the wetland study (Selkirk Environmental 2002a), has different vegetation types.

Wetland habitats would be reclaimed with one of two seed palettes - a wetland mix or a wetland pasture mix. Woody habitats would also be planted with shrubs and trees, including cottonwood, aspen, alder, wouldow, dogwood, hawthorne, and rose. Woody stock may be locally transplanted or commercially purchased. The established shrub habitat would have a forested component with a 5 percent aerial cover. The established forest habitat would have a forested component with a 20+ percent aerial cover.

The riparian corridor would be enhanced with the woody material described above plus additional species on topographic highs. These additional species include lodgepole pine, Engelmann spruce, grand fir, subalpine fir, snowberry, and serviceberry.

Reclamation Best Management Practices

The following primary BMPs would be employed during reclamation to control sedimentation, water volume, and release of storm waters in and around recently reclaimed areas. Silt fencing, straw bales, and LWD would be installed to trap sediments, abate flood flows, and minimize scour on recently regraded landscapes. They would be staggered across the floodplain perpendicular to the direction of flood flow. Management of surface water runoff following active mining would focus on trapping sediments and abating floodwater velocities on reclaimed ground during spring high flows and flood flows.

Reclamation Sequence

Table 3.2-4 shows the conceptual sequence for reclaiming the mining units in two sample mining areas. F-1 and F-10 would be mined when reserves in all other mining areas have been mined. These two mining units would be reclaimed immediately after mining. The reclamation plan would be implemented in annual increments, based on annual plans submitted to USACE and IDL. These annual plans would take up to two calendar years to implement, depending upon the type of wetland habitat that is being reclaimed. It should be noted that proposed reclamation activities would be phased into existing mining activities in the Emerald and Carpenter Creek basins.

Table 3.2-4. Conceptual Reclamation Sequence for Completed Mining Unit

Year	*Reclamation Activities*
2	F-2* and F-3 topsoil respread to final grade and seeded, BMPs removed
3	F-2 and F-3 permanently inundated forested, shrub, and emergent oxbow constructed and planted
	F-4 and P-1 topsoil respread to final grade and seeded, BMPs removed
4	F-4 wetland shrubs and trees planted
	F-5, F-7, and P-2 topsoil respread to final grade and seeded, BMPs removed
5	F-5 and F-7 permanently inundated forested, shrub, and emergent oxbow constructed and planted
	F-6, F-11, and P-3 topsoil respread to final grade and seeded, BMPs removed
6	F-6 and F-11 wetland shrubs and trees planted
	F-8 and F-9 topsoil respread to final grade and seeded, BMPs removed
7	F-8 and F-9 wetland shrubs and trees planted
	F-13, F-14, and P-4 topsoil respread to final grade and seeded, BMPs removed
8	F-13 and F-14 wetland shrubs and trees planted
Final	F-1 and F-10 topsoil respread to final grade and seeded; wetland shrubs and trees planted

* Sample mining unit number.
Source: Selkirk Environmental 2002b

Reclamation Year 1

- Topsoil respread to final floodplain grade
- Reclamation BMPs installed
- Appropriate seed mix for wetland habitats applied
- Revegetated areas irrigated
- Reclaimed mining unit fenced until performance standards are realized, except for ECG ownership that would have long-term fencing

Reclamation Year 2

- Oxbow and deeper wetland habitats excavated
- Appropriate seed mix for excavated wetland habitats applied
- Downed logs and snags placed
- Upland forested corridors and pockets planted
- Riparian corridor enhanced
- Revegetated areas irrigated

Reclaimed Landscape

Wetland hydrology would be restored and functional at the end of Reclamation Year 1 in non-floodplain wetlands and at the end of Reclamation Year 2 in other wetlands. Restoration of the vegetative component would take longer to occur. Historically, ECG has had emergent vegetation re-establish with 80 percent groundcover in three years. Woody vegetation would increase in functional value as it matures. At maturity, the reclaimed landscape would provide the same functions and values as the pre-mined landscape, and would provide the following increased wetland functions:

- Hydrologic support by increasing the permanently saturated/inundated component.
- Storm and flood water abatement by increasing the percent and density of woody vegetation.
- Groundwater exchange to a limited degree by increasing the permanently flooded component.
- Water quality improvement by increasing the retention of overland flow.
- Biologic support by diversifying the woody vegetation and by adding special habitat features.

The Temporary Wetland Impacts and Reclamation Mitigation Concepts Report (Selkirk Environmental 2000) presents a discussion of the elements of the reclaimed landscape for all proposed mining areas. The reclaimed landscape would have the following attributes:

- 1:1 in-kind wetland replacement on other private ownership, with ECG ownership having 1.7:1 in-kind replacement (the overall project replacement ratio is 1.22:1).
- Oxbow complexes reclaimed before they are impacted.
- Net increase of 70 percent in semi-permanently and permanently flooded wetlands.
- Improved riparian streambank condition on approximately 6000 feet of bank (4.1 acres).

- Net increase of 140 percent in forested wetlands.
- Net increase in riparian trees from approximately 1800 to 4140 initially (230 percent), or 3105 (170 percent), with mortality allowance.
- Addition of snags, downed logs, and wildlife corridors.

Table 3.2-5 summarizes the acreage of reclaimed wetlands for ECG and other private ownership. This table is based on mining all oxbows and 133.0 acres of wetland in the proposed mining areas. If oxbow avoidance is selected, the post-mining wetlands would be decreased. If oxbow avoidance reduces the mined wetlands by 10 acres on ECG ownership, the reclamation plan would reclaim and mitigate 17 less acres (10 acres x 1.7 mitigation ratio). If oxbow avoidance reduces the mined wetlands by 10 acres on other private ownership, the reclamation plan would reclaim and mitigate 10 less acres (10 acres x 1.0 mitigation ratio). The overall reclamation ratio would remain the same. If all oxbows are avoided, no oxbows would be constructed.

Table 3.2-5. Acreage of Reclaimed Wetlands by Ownership

Ownership	*Existing Wetlands*	*Post-mining Wetlands*	*Net Change*	*Ratio*
ECG Lands	35.0	59.5	24.5	1.7:1
Other Private Lands	98.0	102.9	4.9	1:1
Total	**133.0**	**162.4**	**29.4**	**1.22:1**

Reclamation Protection and Success

Protection of the reclaimed wetlands from grazing is provided by short- and long-term fencing.

Short-term Fencing - Short-term perimeter fencing would be placed around each reclaimed mining unit during the first year of reclamation. This fencing would remain in place and be maintained during a five-year monitoring period. Fencing would be removed on other private ownership once the monitoring period has ended and all performance standards have been realized (see section 6.2, Plan of Operations, ECG 2002). Short-term perimeter fencing would become long-term perimeter fencing on ECG ownership once performance standards have been realized.

Long-term Fencing - Two types of long-term fencing would be employed, depending on land ownership. On ECG ownership, long-term fencing would be accomplished by extending short-term fencing as recently mined annual units are seeded and planted. Fencing would be maintained on an annual basis as long as ECG owns the property, or until a change in land use activity occurs. This would provide long-term protection to approximately 106 acres of wetlands and non-wetland riparian corridor. This would protect 32 percent of the total project area once mining and reclamation have been completed. It would also protect 59.5 acres of the 162.4 acres of wetland that would be reclaimed (37 percent).

Long-term cluster fencing would also be employed by placing fencing around all clusters of trees in annually reclaimed units. This fencing would remain in place for different lengths of time, depending upon stock size and growth rate. Cluster fencing duration would be based on the following stock size: 1 gallon cottonwood or aspen, 4 to 6 foot height (five to 10 additional years); 5 gallon cottonwood or aspen, 6 to 8 foot height (three to seven additional years); and cottonwood poles, 3 inch caliper, 5 feet above ground (three to five additional years).

Long-term fencing is not intended to protect planted trees until they reach maturity. Long-term fencing is intended to protect planted trees until they are well established with healthy root systems and crown development. Over 3,100 planted specimens (25 percent mortality of 4,140 planted stock) are warranted to survive with this plan. New planted specimens would be protected for eight to 15 years and would be producing seed as well as root suckering providing additional trees annually. This is adequate mitigation even if mortality from cattle or other factors occurs after the period of long-term fencing. Some mortality after the period of long-term fencing is beneficial in terms of creating specialized habitat features for primary and secondary decomposers as well as other members of the food chain.

The objective of reclamation and mitigation is to restore the functions and values of the wetland resource that are impacted. If impacts to wetlands cannot be avoided and unavoidable impacts have been minimized to the maximum extent possible, the remaining option is to compensate for remaining impacts through compensatory mitigation. Restoring impacted wetlands, as proposed for this project, represents a form of mitigation with the highest chances for success. ECG has restored impacted wetlands in Emerald and Carpenter Creeks over the last 12 years, demonstrating the success of this method.

3.3 Vegetation

Vegetation includes all terrestrial and aquatic plants and plant communities, including rare, threatened, and endangered species. Plants described in this document include trees, shrubs, grasses, sedges, forbs, and aquatic plants. Plant communities are repeatable associations of dominant and subordinate plants, which are consistently associated with each other in similar habitat (Taylor 1992). The ROI used to determine direct vegetation impacts is equivalent to the project area. Considerations of indirect and cumulative effects to this resource include the larger floodplain and the St. Maries watershed.

3.3.1 Affected Environment

The proposed project area is located within the Northern Rocky Mountain Forest Steppe - Coniferous Forest - Alpine Meadow Province (Bailey 1995). Mountains in this province rise to over 2,700 meters (9,000 feet) and are often bisected by mountain trenches creating wide flat valleys (Bailey 1995). Altitude vegetation zones are a striking characteristic of this province. The upper most zones are alpine, dominated by fellfields, graminoids and cushion plants. Subalpine forests are comprised of Englemann Spruce (*Picea englemannii*), subalpine fir (*Abies lasiocarpa*), and mountain hemlock (*Tsuga mertensiana*) as significant components in this watershed. Montane forests contain various associations of Douglas-fir (*Pseudotsuga menziesii*), grand-fir (*Abies grandis*), western larch (*Larix occidentalis*), western white pine (*Pinus monticola*), lodgepole pine (*Pinus contorta*), and ponderosa pine (*Pinus ponderosa*). Western hemlock (*Tsuga heterophylla*), aspen (*Populus tremuloides*), and western red-cedar (*Thuja plicata*), interspersed with sagebrush or grasslands are common in lower montane areas (Bailey 1995; Patterson et al. 1985). Riparian vegetation along rivers may be dominated by black cottonwood (*Populus balsamifera*), willows (*Salix* spp.), and coniferous or mixed deciduous-coniferous forest.

The proposed project area along the St. Maries River is located in the St. Maries River watershed. Major portions of the basin, including the St. Maries River, were burned in an enormous wildfire in 1910 (Jankovsky-Jones 1999). Prior to this fire, riparian areas were dominated by forests of western red-cedar, Douglas-fir, and grand-fir. Most drainages affected by the fire are now dominated by a mosaic of riparian shrubs (Jankovsky-Jones 1999). Human activities such as mining, hydrologic manipulation, logging, livestock grazing, and ground disturbance have altered vegetation communities throughout the watershed. Introduced pasture grasses such as Kentucky bluegrass (*Poa pratensis*), and redtop (*Agrostis stolonifera*) are common in meadows and riparian areas and stands of reed canarygrass (*Phalaris arundinacea*) form dense monocultures, often displacing native vegetation in areas where water levels have been manipulated (Jankovsky-Jones 1999). Human impacts in the basin have also led to the introduction of noxious weeds such as knapweeds (*Centaurea* spp.), tansy (*Tanecetum vulgare*), meadow hawkweed (*Hieracium pratense*), Canada thistle (*Circium arvense*), and musk thistle (*Carduus nutans*) (Jankovsky-Jones 1999). Invasion by purple loosestrife (*Lythrum salicaria*) and Eurasian water millfoil (*Myriophyllum spicatum*) are becoming an increasing concern throughout the basin (Jankovsky-Jones 1999).

Current vegetation communities within the project area include coniferous forest, cottonwood forest, riparian shrub, upland meadow, wet meadow, and communities associated with gravel bars, oxbows and ponds (Duebendorfer 2002a; Dostal and Dawes 2002). Some of these communities are wetlands or have wetlands within their boundaries. Wetlands are described fully in section 3.2, Wetlands. The following descriptions of vegetation communities present within the proposed project area are summarized from existing technical reports (Duebendorfer 2002a; Dostal and Dawes 2002). These reports appear in Volume II Appendices F and G of this DEIS. The estimated extent of each vegetation community within the project area is provided in Table 3.3-1.

In addition, ECG conducted an inventory of deciduous and coniferous trees within the visual corridor of the proposed mining areas. The inventory identified 690 conifers, 1,064 deciduous trees and 50 snags for a total of 1,804 trees (Selkirk Environmental 2002b).

Rare, Threatened, and Endangered Plants

All agency consultation for threatened and endangered plant species was conducted by plant ecologist Tom Duebendorfer (2002a and 2002b). Rare plants such as those listed by the Idaho Conservation Data Center (CDC), that include plants listed by the United States Forest Service (USFS) Region 1 and the State of Idaho, were not addressed in Duebendorfer 2002a or Duebendorfer 2002b and are therefore not analyzed in this document. Volume II Appendix G contains a list of federally listed plant species provided by the USFWS.

The Ute ladies'-tresses orchid (*Spiranthes diluvialis*), was the only plant species listed by the USFWS as potentially occurring within the project area (USFWS 1998; USFWS 2002). However, the only known population of the federally threatened water howellia (*Howellia aquatilis*) in Idaho occurs 20 miles from the proposed project area. Therefore, surveys were conducted for both Ute ladies'-tresses orchid, and water howellia. No Ute ladies'-tresses orchid or water howellia were found during the 1998 and 1999 surveys (Duebendorfer 2002a). Suitable habitat for Ute ladies'-tresses was not found, while limited suitable habitat for water howellia was found (Duebendorfer 2002a). The latter habitat, small shallow wetlands that must dry out by late summer, is potentially found in all five oxbow complexes, in older oxbow areas (water is shallower and inundation is less frequent) and in

Table 3.3-1. Summary of Vegetation Communities in the Project Area

Vegetation Community	*Estimated Area*	*Description of the Community*
Coniferous Forest	< 2.02 hectares (approximately 5 acres)	Occurs in scattered pockets within the proposed project area and is represented by a canopy of Douglas fir and western red cedar.
Cottonwood Forest	7.12 hectares (approximately 17.6 acres)	Black cottonwood stands occur in association with deciduous shrubs on some streambanks, terraces, and oxbow areas.
Riparian Shrub	13.44 hectares (approximately 33.2 acres)	Present along banks, terraces, and in oxbow areas; dominated by willow, black hawthorne (*Crataegus douglasii*), red-osier dogwood (*Cornus sericea)*, and thin-leaf alder (*Alnus incana)*.
Upland Meadow	76.65 hectares (approximately 189.4 acres)	Occurs on former floodplain areas and on dry areas between oxbow channels dominated by grasses such as timothy (*Phleum pratense*), orchardgrass, (*Dactylis glomerata*), red fescue (*Festuca rubra*), Kentucky bluegrass, and redtop bentgrass (*Agrostis stolonifera*).
Wet Meadow	29.22 hectares (approximately 72.2 acres)	Herbaceous communities including water foxtail (*Alopecurus geniculatus*), meadow foxtail (*Alopecurus pratensis*), and sedges (*Carex spp*.). These areas are often linked hydrologically to the St. Maries River via subsurface interflow.
Gravel Bar	N/A	Exist along the banks and within the floodplain of the St. Maries River. Persistent gravel bar vegetation is usually sandbar willow (*Salix exigua*), whereas, species such as toadrush (*Juncus bufonius*), canary reedgrass, and manna grass (*Glyceria grandis*) have an ephemeral presence dependent on the timing of the last scouring flood.
Pond	N/A	Occur as either remnant oxbows or isolated depressions with no defined outlet. Vegetation includes water lily, water starwort, sedges, cattails, water plantain (*Alismo plantago-aquatica*), swamp horsetail (*Equisetum fluviatile*), and speedwell (*Veronica scutellata*).
Oxbow	3.84 hectares (approximately 9.5 acres)	Occur throughout the floodplain of the St. Maries River and are hydrologically connected to the river and perennially flooded. Common aquatics include water lily (*Nuphar luteum*), bur-reed (*Sparganium eurycarpum*), water starwort (*Callitriche verna*), and bladderwort (*Ultricularia vulgaris*). Common cattail (*Typha latifolia*), and alder were common on oxbow borders.
Total	**132.29 hectares (327.5 acres)**	

Source: ECG 2000, Selkirk Environmental 2002a, Dostal and Dawes 2002.

portions of remnant oxbows (ponds and isolated depressions). Table 3.3-2 describes the potential for these two species to occur in the project area.

Table 3.3-2. Federally Listed Plant Species Potentially Occurring in the Project Area.

Species	*Federal Status*	*Potential to Occur in Project Area*
Ute Ladies' tresses Orchid (*Spiranthes diluvialis*)	Threatened	Not likely - Project area is not suitable habitat for Ute ladies' tresses since few of its associated species are present and the hydrologic regime of the St. Maries river does not coincide with water regimes associated with other populations in Idaho.
Water Howellia (*Howellia aquatilis)*	Threatened	Not likely - It is possible, but unlikely, that water howellia is present on-site because suitable habitat is minimal, the plant is an annual, an intense two-year on-site survey did not locate it, and another survey covering the St. Maries basin and other northern Idaho areas did not locate it (refer to Volume II Appendix F).

Source: Duebendorfer 2002a

3.3.2 Environmental Consequences

Potential impacts to vegetation from garnet mining include direct removal of vegetation and indirect impacts, such as the increased invasion of exotic plants in disturbed areas. Direct, temporary loss of vegetation is expected for all action alternatives.

3.3.2.1 Alternative 1 - No Action

Under the No Action alternative, mining activities would continue on 77.8 acres of uplands, impacting vegetation in this area. In addition, current ongoing impacts to vegetation occurring within the proposed project area from cattle grazing and impervious surface runoff would likely continue under the No Action alternative.

3.3.2.2 Impacts Common to All Alternatives

The following impacts to vegetation are possible for all mining activities.

1) Direct, temporary loss of vegetation due to mining activities. Direct impacts result from land clearing and excavation activities, as well as the placement of fill from the sediment berm. The extent (i.e., acreage) of each vegetation community to be impacted was not determined.

2) Temporary alteration of plant community structure through the removal of mature trees and shrubs.

3) Temporary incremental loss of woody habitat. Trees and shrub vegetation would be removed from the subject wetlands and surrounding floodplain areas as mining progresses in annual increments. A total of 693 trees would be harvested incrementally throughout the overall mining period, and they would be replaced incrementally with 4,140 young trees over the same time. Figure 1.3 in Volume II Appendix D shows the number and location of snags, conifers, and deciduous trees to be harvested or removed and the number and location of trees that would be avoided or not removed during mining. Without a revegetation plan, a shrub component would become re-established in several years, and would approach a pre-mined condition in approximately 10 to 15 years. Likewise, a tree component would naturally re-establish soon after mining is concluded. The tree component would take 20 years or longer to reach the stature and habitat quality provided by the pre-mined condition. These temporary, and temporal, impacts cannot be avoided, but can be minimized by a revegetation plan that would accelerate the recovery time.

4) Changes in vegetation caused by mining activities and the proposed habitat restoration may set back the successional stage of local plant communities. Earlier successional stages favor weeds and other fast growing plants often at the expense of habitat specialists.

5) Increased invasion risk of non-native plant species, including noxious weeds. Weeds are plants that are adapted to disturbance. Non-native plants (from other regions of the world) can out-compete native species, make habitats unsuitable for wildlife, and can sometimes change ecosystem functioning. These non-natives are often dependent on human-caused disturbance for their initial establishment.

3.3.2.3 Impacts Unique to Specific Alternatives

Although each alternative causes the same general types of impacts to vegetation, differences occur in the area impacted. At this time, the extent of each vegetation community cannot be quantitatively assessed. However; the total non-wetland vegetation impacts can be quantified. Alternative 8, which avoids all oxbow complexes, would mine the least acreage, and would therefore impact the least amount of vegetation. Alternatives 2 and 3 would impact the most vegetation (327.5 acres); Alternatives 9 and 10 would impact intermediate amounts (261.3 acres and 281.8 acres respectively).

Alternatives 2 and 3

Alternatives 2 and 3 are equal in non-wetland vegetation removal. This is based on the calculation that there are 327.5 acres to be mined, minus 133 acres of jurisdictional wetlands, leaving 194.5 acres of other vegetation that would be directly impacted.

Alternative 8

Alternative 8 would impact the least acreage of non-wetland vegetation. This is based on the calculation that there are 327.5 acres to be mined, minus 133.0 acres of jurisdictional wetlands, minus 27.1 acres of non-wetland (in oxbow complexes 1 through 5), equals 167.4 acres of other vegetation that would be directly impacted.

Alternative 9

Alternative 9 would impact more non-wetland vegetation than Alternative 8, but less than Alternatives 2 and 3. This is based on the calculation that there are 327.5 acres to be mined, minus 133.0 acres of jurisdictional wetlands, minus 17.2 acres of non-wetland (in oxbow complexes 1, 2, and 3), equals 177.3 acres of other vegetation that would be directly impacted.

Alternative 10

Alternative 10 would impact more non-wetland vegetation than Alternatives 8 and 9 but less than Alternatives 2 and 3. This is based on the calculation that there are 327.5 acres to be mined minus 133.0 acres of jurisdictional wetland, minus 11.0 acres of non-wetland (in oxbow complexes 2 and 4), equals 183.5 acres of other vegetation that would be directly impacted.

Rare, Threatened, and Endangered Plants

Impacts to rare, threatened, and endangered plants are unlikely under all alternatives (Table 3.3-3). No rare, threatened, or endangered plants have been identified in the project area. Suitable habitat for Ute Ladies' tresses was not found and only limited suitable water howellia habitat has been identified (refer to Volume II Appendix F). Alternative 8 would have no potential to impact water howellia habitat since all oxbows are avoided (see section 3.2.2). Alternatives 2 and 3 would have a greater potential to effect potential water howellia habitat since they would impact all oxbows.

Table 3.3-3. Potential Impacts to Federally Listed Plant Species from Garnet Mining Alternatives

Species	*Potential Impacts*	*Determination of Effect*[1]
Ute Ladies'-tresses Orchid (*Spiranthes diluvialis*)	None	No effect
Water Howellia (*Howellia aquatilis)*	Not likely - Mining activities may impact potential water howellia habitat within the project area.	Not likely to affect.

Note: 1. Determination of effect is based on information provided by Duebendorfer (2002).

3.3.3 Mitigation

Where impacts to vegetation are expected, measures to avoid or minimize disturbance would be undertaken. Mitigation would occur before mining activities begin, during mining, and after mining activities are completed in each unit.

3.3.3.1 Prior to Mining

The ECG Operations Manager would be tasked to ensure that mitigation measures are implemented.

3.3.3.2 During Mining

Woody vegetation would be replaced. ECG identified 1,064 deciduous trees, 690 conifers, and 50 snags within the proposed mining areas of the project area during a 1999 tree inventory (Selkirk Environmental 2002b). During the proposed 20-year mining cycle, 693 of these trees would be removed, or an average of 35 trees per year. The reclamation and mitigation plans indicate that ECG would plant up to 4,140 trees over a 20-year reclamation cycle. These trees would be used to replace lost forested wetlands, provide an overstory component of at least 5 percent in reclaimed scrub-shrub wetlands, and to provide pockets and corridors of upland forest. Performance standards in section 7.2 of Volume II Appendix D indicate that 75 percent of the planted trees must survive. This means that ECG would insure that at least 3,105 trees survive as a replacement for the 693 trees lost during mining. These trees would be planted in 66.2 acres of reclaimed land, providing an average density of at least 47 trees per acre. In addition, the reclamation designs (Volume II Appendix D) indicate that 6,627 shrubs would be planted over a 20-year reclamation cycle. These shrubs would be planted over the same 66.2 acres. This would provide an average shrub density of at least 100 shrubs per acre.

Monitoring of land clearing, and mining activities would be routinely inspected by the Operations Manager to ensure that mitigation measures are implemented. Loss of trees would be avoided wherever possible and replaced when unavoidable.

3.3.3.3 Post Mining

Fenced enclosures (to limit access by livestock and wildlife) would be erected to allow vegetation to reestablish. Fencing used to exclude livestock would not hinder wildlife movement. Revegetation efforts would be evaluated annually to determine success and necessary remedial actions to comply with performance standards identified in the reclamation assurance plan prepared by ECG (Volume II Appendix D, sections 7.2 and 7.3).

3.4 Wildlife

Wildlife resources for this analysis are defined as all terrestrial fauna that may occur within the proposed project area and immediate vicinity, or that use project area habitat to complete a portion of their life cycle. Wildlife species are evaluated in the following groups: birds, including raptors, waterbirds and shorebirds, upland game birds, and other avian species; mammals, including small mammals, large mammals, carnivores, and bats; and reptiles and amphibians. Threatened and endangered species and other special status species are also discussed in this section. The project area represents the ROI used to determine direct wildlife impacts. The ROI used to determine indirect and cumulative impacts includes the project area and the wildlife community of the St. Maries watershed.

3.4.1 Affected Environment

The lower St. Maries River within the proposed project area is a low-gradient stream with meandering channels, flowing through a broad valley. Valley habitats of the proposed project area include coniferous forest, cottonwood forest, riparian shrub, upland meadow, wet meadow, and communities associated with gravel bars, oxbows and ponds (Dostal and Dawes 2002). These habitats are described in detail in section 3.3, Vegetation. Beyond the wide river valley, uplands vary from low relief mountains with slopes averaging 10 to 35 percent on spur ridges and side-hills, and slopes as steep as 60 percent in some drainages (USFS 1999).

Project area habitat condition is shaped by past wildfires and human activities such as logging, mining, and grazing. Grazing activity is ongoing throughout the project area and impacts to plant species composition and structure are evident in most vegetation communities (personal communication, Dawes 2002; USFS 1999). Idaho State Highway 3 and the adjacent St. Maries Railroad parallel the river to the north throughout the proposed project area, creating barriers to wildlife movement to or from uplands and valley habitats. Forman and Alexander (1998) review the effects that roads and other linear development can have on wildlife, including acting as barriers.

Use, or potential use, of project area habitat by a large variety of terrestrial wildlife species for breeding, foraging, and as transitional habitat is well documented (Dostal and Dawes 2002; USFS 1999). Common birds, mammals, amphibians, and reptiles known or likely to occur in the project area or vicinity are listed in Table 3.4-1. For more detailed information on the wildlife that occur in the project area, see Dostal and Dawes 2002.

Threatened, and Endangered and Special Status Wildlife

The CDC tracks known occurrences of threatened, endangered and rare species, throughout the state. The USFWS Spokane Regional Office also monitors likely presence or known occurrence of threatened, endangered, candidate, species of concern, and watch species. Both CDC and USFWS were contacted by staff of Wildlife Habitat Institute (Dostal and Dawes 2002) and by Duebendorfer (2002) to determine the likelihood of special status wildlife occurring within the proposed project area. These agencies provided information regarding the potential occurrence of special status species near the proposed project area (USFWS 1998; USFWS 2002). Additional contacts with the USFWS and USFS were also made by Science Applications International Corporation (SAIC) (personal communication, Donaldson 2002, Stock 2002). The project area and vicinity were evaluated for habitat suitability and presence of special status species and two site visits were made to assess habitats, and survey for wildlife presence and sign (Dostal and Dawes 2002). Special status species that were evaluated for possible occurrence within the project area are described in Table 3.4-2 (Dostal and Dawes 2002). For more detailed information on the special status species that occur in the project area, see Dostal and Dawes 2002.

3.4.2 Environmental Consequences

Garnet mining would potentially impact wildlife by causing temporary loss of habitat, potential mortality of small and immobile wildlife species, temporary avoidance of habitat due to noise and activities associated with mining operations, and disruption of wildlife movement. The analysis of impacts here is qualitative rather than quantitative.

3.4.2.1 Alternative 1 - No Action

Under the No Action alternative, mining activities would continue on 77.8 acres of upland where general wildlife habitat would be impacted. The impacts to wildlife under this alternative would be similar to other mining alternatives, as described in section 3.4.2.2.

Table 3.4-1. Selected Common Wildlife Species Using Habitat Types in the Region of Influence (Page 1 of 3)

Species	*CONF*	*COTF*	*RISH*	*UPME*	*WETM*	*POND*
Birds						
American Dipper		X	X			X
American Kestrel (*Falco sparverius*)		X	X	X	X	
American Robin	X	X	X	X	X	
Bank Swallow						X
Belted Kingfisher		X	X			X
Black-billed Magpie			X			
Brewer's Blackbird				X	X	X
Canada goose (*Grus canadensis*)						
Cedar Waxwing	X					
Chickadee Species	X	X	X			
Common Merganser						X
Common Snipe						X
Dark-eyed Junco	X	X	X			
Finch Species	X					
Flycatcher Species	X	X	X			
Gray Jay	X					
Great blue heron		X				X
Great Horned Owl	X					
Greater Yellowlegs						X
Grosbeak Species	X					
Hooded Merganser		X				
Hummingbird Species			X			
Killdeer				X	X	
Kinglet Species	X					
Mallard						X
Mountain Bluebird	X	X	X			
Northern Flicker	X	X	X			
Northern Harrier (*Circus cyaneus*)				X		
Nuthatch Species	X					
Osprey (*Pandion haliaetus*)	X	X	X			X
Raven				X	X	

Legend: CONF = Coniferous Forest, COTF = Cottonwood Forest, RISH = Riparian Shrub, UPME = Upland Meadow, WETM = Wet Meadow, POND = Ponds, Marshes, and Gravel Bars.
Source: Dostal and Dawes 2002

Table 3.4-1. Selected Common Wildlife Species Using Habitat Types in the Region of Influence (Page 2 of 3)

Species	*CONF*	*COTF*	*RISH*	*UPME*	*WETM*	*POND*
Red-tailed Hawk (*Buteo jamaicensis*)	X	X	X	X	X	
Red-winged Blackbird						X
Rough Legged Hawk (*Buteo lagopus*)	X	X	X	X	X	
Ruffed Grouse			X			
Sparrow Species	X	X	X	X	X	
Spotted Sandpiper						X
Steller's Jay	X					
Teal Species						X
Tree Swallow	X	X	X			
Vireo Species	X	X	X			
Warbler Species	X	X	X			
Western Bluebird		X	X			
Wood Duck		X				X
Woodpecker Species	X					
Mammals						
Badger				X		
Bat Species	X	X	X			X
Beaver		X	X			X
Black Bear	X					
Bobcat	X					
Chipmunk Species	X					
Columbian Ground Squirrel				X		
Coyote	X	X	X	X	X	X
Elk	X	X	X			
Ermine	X	X	X			
Long-tailed Weasel	X	X	X			
Mink	X	X	X			X
Montane Vole				X	X	
Moose	X	X	X			
Mountain Lion	X					
Muskrat		X	X			X
Northern Pocket Gopher				X	X	

Legend: CONF = Coniferous Forest, COTF = Cottonwood Forest, RISH = Riparian Shrub, UPME = Upland Meadow, WETM = Wet Meadow, POND = Ponds, Marshes, and Gravel Bars.
Source: Dostal and Dawes 2002

Table 3.4-1. Selected Common Wildlife Species Using Habitat Types in the Region of Influence (Page 3 of 3)

Species	*CONF*	*COTF*	*RISH*	*UPME*	*WETM*	*POND*
Porcupine	X					
Red Squirrel	X					
River Otter		X	X			X
White-tailed Deer	X	X	X	X	X	
Reptiles						
Common Garter Snake	X	X	X			X
Western Painted Turtle *(Chrysemys picta belli)*		X	X			X
Western Terrestrial Garter Snake *(Thamnophis elegans)*	X	X	X	X	X	
Amphibians						
Spotted Frog	X	X	X			X

Legend: CONF = Coniferous Forest, COTF = Cottonwood Forest, RISH = Riparian Shrub, UPME = Upland Meadow, WETM = Wet Meadow, POND = Ponds, Marshes, and Gravel Bars.
Source: Dostal and Dawes 2002

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Table 3.4-2. Threatened, Endangered, and Special Status Species With Potential to Occur Within or Near the Proposed Project Area (Page 1 of 2)

Species	*Status*	*Potential to Occur in Project Area*
Bald Eagle (*Haliaetus leucocephalus*)	FT	Possible - USFS indicates this species may use the area during migration for short periods of time.[2]
Black-backed Woodpecker (*Picoides articusi*)	SC	Not likely - Preferred habitat, spruce/fir forests, occurs at higher elevations than the project area.[1]
Boreal Owl (*Aegolius flunereus*)	SC	Not likely - Habitat, subalpine forests, occurs at higher elevations than the project area.[2]
Boreal toad (*Bufo boreas boreas*)	SC	Likely - The project area is potential foraging and breeding habitat.[1]
Common Loon (*Gavia immer*)	SC	Not likely - This species may use the St. Maries River during migration but not the project area as no large bodies of water are present.[1]
Coeur d' Alene Salamander (*Plethodon idahoensis*)	SC	Not likely - Preferred habitat, waterfall spray zones, spring seeps, and stream sides with exposed bedrock or rock out-croppings, does not exist in the project area.[2]
Fisher (*Martes pennanti*)	SC	Possible - May use project area as a travel corridor.[2]
Flammulated Owl (*Otus flammeolus*)	SC	Not likely - Preferred habitats of old growth ponderosa pine, Douglas- and grand-firs is not present in the project area. [2]
Gray Wolf (*Canis lupus*)	E/XN	Possible - The Marble Mountain Pack is 8 miles away, so use of the project area as a travel corridor is possible.[3]
Grizzly Bear (*Ursus arctos*)	FT, ST	Not likely - According to the USFS and USFWS this species does not occur near the project area.[4]
Harlequin Duck (*Histrionics histrionicus*)	SC	Not likely - Preferred habitat, high gradient streams with cobble substrate, is not present in the project area. [2]
Lynx (*Lynx canadensis*)	FT, SC	Possible - Habitat for this species does not exist in the project area, but the area may be used as a travel corridor.[4]
Northern Goshawk (*Accipiter gentilis*)	SC	Likely - This species is a forest generalist with a large home range.[2]
Northern leopard frog (*Rana pipiens*)	SC	Not likely - The project area is outside the Idaho range for this species, although suitable habitat is present.[1]
Northern Pygmy Owl (*Otus flammeolus*)	SC	Possible - The species is found in forest or open woodlands and frequents open meadows.[1]

Table 3.4-2. Threatened, Endangered, and Special Status Species With Potential to Occur Within or Near the Proposed Project Area (Page 2 of 2)

Species	*Status*	*Potential to Occur in Project Area*
Townsend's Big-eared Bat (*Plecotus townsendii*)	SC	Likely - This species is a forest generalist and may forage in the project area.[1]
Upland Sandpiper (*Bartramia longicauda*)	SC	Possible - Meadows may be suitable foraging habitat.[2]
Wolverine (*Gulo gulo*)	SC	Possible - May travel through project area.[1]

FT-Federally Threatened; FE- Federally Endangered; E/XN-Listed Endangered/Non-Essential, Experimental; SC-Idaho Species of Special Concern.

Sources:
1. Groves et al.1997
2. Dostal and Dawes 2002
3. Personal communication, Donaldson 2002
4. Personal communication, Stock 2002

3.4.2.2 Impacts Common to All Alternatives

The following temporary impacts to wildlife are anticipated for all mining alternatives. All would be very localized and would affect individual organisms that inhabit or use the affected area.

1) Temporary loss or displacement of general wildlife habitat due to mining activities. Birds would likely lose nesting, foraging, roosting, and wintering habitats. Mammals would lose potential breeding, foraging, and wintering habitat.

2) Temporary degradation of wildlife habitat due to activities and noise associated with mining operations. Many wildlife species avoid areas with increased human activity and noise (Reijen et al. 1995; Rost and Bailey 1979). Changes in vegetation caused by mining activities and the proposed habitat restoration would change the successional stage of the plant community to an earlier stage. Early successional stages favor generalist animal species, often at expense of habitat specialists. Corvids and jays are generalist bird species that are effective nest predators on ducks and other species. Brown-headed cowbird presence may result in increases in brood parasitism on nesting songbirds in the vicinity of the project area

3) Fragmentation of wildlife habitat due to construction of temporary roads and mining activities including wet and dry panels. Habitat fragmentation can disrupt wildlife movement patterns and migration corridors.

4) Potential direct mortality of small, immobile, or young wildlife due to mining activities. Small species such as voles and mice may be directly killed by mining activities since they are hard to see and do not move large distances. Amphibians go through a sensitive life cycle stage where they are relatively immobile, i.e., tadpoles cannot move out of a pond until they metamorphose. Some species such as birds are very mobile for most of their lives but are immobile while they are in their nests.

3.4.2.3 Impacts Unique to Specific Alternatives

Table 3.4-3 summarizes potential impacts to wildlife groups from proposed garnet mining alternatives. Potential impacts would be localized.

Special Status Wildlife Impacts

Anticipated potential impacts to special status wildlife species are presented in Table 3.4-4. Determination of potential effect is based on baseline information gathered by Dostal and Dawes (2002). The determination for federally threatened and endangered species uses the language required by Section 7 of the Endangered Species Act (ESA). The determination for other special status species uses language used in Forest Service Biological Evaluations.

3.4.3 Mitigation

Where impacts to wildlife and wildlife habitat are expected, measures to avoid or minimize harm should be undertaken. Mitigation would occur before mining activities, during mining, and after mining activities are completed in each unit.

Table 3.4-3. Potential Impacts to Wildlife Groups

Species Group	*Potential Environmental Consequence Summary*
Birds	
Raptors	Most raptors within the project area utilize forests edges and uplands rather than oxbow pond habitat. Raptors may be more impacted by increased roads and Highway 3 traffic associated with Alternatives 8, 9, and 10.
Waterbirds	Alternatives that mine oxbows (2 and 3) are most detrimental to waterbirds due to disturbance to, or loss of, preferred nesting and foraging habitat. Alternative 8 avoids impacts to all oxbow complexes.
Shorebirds	Spotted sandpipers nest and forage along stream and pond shorelines and would be most impacted by Alternatives 2 and 3. Alternative 8 would be least detrimental to spotted sandpipers.
Other Birds	Other birds, particularly songbirds, benefit from vertical structure, and cover provided by riparian shrubs and emergent vegetation associated with oxbows and other wetlands. Alternative 8 is the least detrimental to nesting and foraging habitat of these birds.
Mammals	
Shrews	Shrews generally prefer riparian and wetland habitats. Alternative 8 avoids impacts to all oxbow complexes and is least detrimental to shrews.
Bats	Bat roosting habitat likely occurs within forested sections of the proposed project area. Alternatives which remove the fewest trees are least detrimental to bats.
Rodents	Rodents use a variety of habitats within the project area. Since alternative 8 impacts the least amount of habitat, it may be the least detrimental to most rodents.
Carnivores	Carnivore impacts include loss of habitat and disturbance due to mining activities. Since Alternative 8 impacts the least amount of habitat, it may be the least detrimental.
Ungulates	Maintenance of ungulate foraging and hiding cover associated with oxbow complexes (Alternatives 8-10) reduces impacts to ungulates.
Amphibians and Reptiles	
Amphibians	All amphibians potentially occurring within the project area are dependent on aquatic communities for reproduction. Most are dependent on aquatic communities for other components of their life cycle. Alternative 8 is the least detrimental to amphibians.
Reptiles	Most reptiles within the project area are associated with stream, river, and pond riparian areas and wetlands. Alternative 8 is the least detrimental to reptiles.

Table 3.4-4. Potential Impacts to Special Status Wildlife Species (Page 1 of 2)

Species	*ESA Status*[2]	*Potential Impacts*	*Determination of Effect*[1]
Bald Eagle (*Haliaetus leucocephalus*)	FT	None	No effect
Black-backed Woodpecker (*Picoides articusi*)	NA	None	No impact
Boreal Owl (*Aegolius flunereus*)	NA	None	No impact
Boreal toad (*Bufo boreas boreas*)	NA	Possible - Boreal toads may be impacted by habitat loss and increased mortality due to mining activities and increased traffic.	May adversely impact individuals, but not likely to result in a loss of species viability in the ROI, nor cause a trend to federal listing or a loss of species viability rangewide.
Common Loon (*Gavia immer*)	NA	None	No impact
Coeur d' Alene Salamander (*Plethodon idahoensis*)	NA	None	No impact
Fisher (*Martes pennanti*)	NA	Possible - Mining activities may block potential travel corridors.	May adversely impact individuals, but not likely to result in a loss of species viability in ROI, nor cause a trend to federal listing or a loss of species viability rangewide.
Flammulated Owl (*Otus flammeolus*)	NA	None	No impact
Gray Wolf (*Canis lupus*)	FE	Possible - Mining activities may block potential travel corridors.	May affect, not likely to jeopardize continued existence.
Grizzly Bear (*Ursus arctos*)	FT	None	No effect
Harlequin Duck (*Histrionics histrionicus*)	NA	None	No impact
Lynx (*Lynx canadensis*)	FT	Possible - Mining activities may block potential travel corridors.	May affect, not likely to adversely affect.

Note: 1. Determination of effect is based on baseline information gathered by Dostal and Dawes (2002). The determination for federally threatened and endangered species uses language required by Section 7 of the ESA.

Table 3.4-4. Potential Impacts to Special Status Wildlife Species (Page 2 of 2)

Species	*ESA Status*[2]	*Potential Impacts*	*Determination of Effect*[1]
Northern Goshawk (*Accipiter gentilis*)	NA	Possible - Goshawks may be impacted by loss of potential prey due to mining activities.	May adversely impact individuals, but not likely to result in a loss of species viability in the ROI, nor cause a trend to federal listing or a loss of species viability range-wide.
Northern leopard frog (*Rana pipiens*)	NA	None	No impact
Northern Pygmy Owl (*Otus flammeolus*)	NA	Possible - Pygmy owls may be impacted by loss of potential prey due to mining activities.	May adversely impact individuals, but not likely to result in a loss of species viability in the ROI, nor cause a trend to federal listing or a loss of species viability range-wide.
Townsend's Big-eared Bat (*Plecotus townsendii*)	NA	Possible - This species may be impacted by loss of potential prey due to mining activities.	May adversely impact individuals, but not likely to result in a loss of species viability in the ROI, nor cause a trend to federal listing or a loss of species viability range-wide.
Upland Sandpiper (*Bartramia longicauda*)	NA	Possible - Upland sandpipers may be impacted by loss of potential prey due to mining activities.	May adversely impact individuals, but not likely to result in a loss of species viability in the ROI, nor cause a trend to federal listing or a loss of species viability range-wide.
Wolverine (*Gulo gulo*)	NA	Possible - Mining activities may block potential travel corridors.	May adversely impact individuals, but not likely to result in a loss of species viability in the ROI, nor cause a trend to federal listing or a loss of species viability range-wide.

Note: 1. Determination of effect is based on baseline information gathered by Dostal and Dawes (2002). The determination for federally threatened and endangered species uses language required by Section 7 of the ESA.
2. Status in accordance with Endangered Species Act (FT - Federally Threatened; FE - Federally Endangered; NA - Not Applicable.

3.4.3.1 Prior to Mining

Prior to removal of trees in March or April, forested habitat would be evaluated for the presence of nesting owl and other raptor species. The Operations Manager would ensure that mitigation measures are implemented.

3.4.3.2 During Mining

Monitoring of land clearing, and mining activities would be routinely inspected by the Operations Manager to ensure that mitigation measures are implemented. Vegetation removal would take place outside of nesting season. Fences constructed on the work location would be designed so as not to inhibit movement of big game such as moose.

3.4.3.3 Post Mining

The restoration plan would include snags and downed logs. When possible, existing snags would be retained by avoidance during mining activities. Snags and logs would comprise a variety of species with a range of diameter as recommended in Dostal and Dawes 2002.

3.5 Fisheries

Fisheries resources for this analysis are defined as species of fish that use the St. Maries watershed, including threatened, endangered and other special status fish. The St. Maries watershed was selected for impact analyses since fish are highly mobile and migratory within river systems and their tributaries.

3.5.1 Affected Environment

The project area is located in the floodplain of the St. Maries River, which ultimately drains into the Interior Columbia River Basin. There are six tributaries that flow into the St. Maries River within the project area, Emerald Creek, Carpenter Creek, Adams Creek, Hatton Creek, Pierce Creek, and Olson Creek. A series of oxbows, swales, and depressions occur within the floodplain. Section 3.3 describes riparian vegetation along the rivers, creeks, and oxbows and section 3.2 describes wetlands in the project area. The St. Maries River flows into the St. Joe River approximately 35 river miles downstream of the mining site, and is encompassed within the St. Joe River Basin.

Riparian areas along the St. Maries River have been impacted by adjacent land uses such as timber harvest, roads, livestock grazing, and mining, and by floods and fires, which in turn, have increased sediment production, channel instability, and nutrient loading (USFS 2001a). Data from aquatic habitat inventories in the St. Maries watershed area suggest the prolonged absence of forested stands in these areas has impaired the protection of stream temperatures due to reduced streamside canopies (USFS 2001a). As a result, the St. Maries River segment from Clarkia (6 miles upstream of the project area) to Mashburn (12 miles downstream from the project area) is listed on Idaho's CWA 303(d) list as not meeting their designated uses. This entire segment has been determined to be water quality limited for "unknown cause" as the parameter of concern. In addition, the St. Maries River segment from Clarkia to the St. Joe is listed for habitat alteration, nutrients, and sediment as the parameters of concern. The designated uses for the St. Maries River from Clarkia to Carpenter

Creek are cold-water biota, primary contact recreation, domestic water supply, and special resource water. The most substantial limiting factor for the St. Maries watershed is water temperature.

Aquatic habitat in the St. Maries River area can be generally described as relatively homogenous with little structural diversity and low cover complexity (USFS 2001a). In the project area, stream substrate is dominated by fines and sands and streams are low gradient (USFS 2001a). Small substrate particles make the habitat unsuitable for salmonid spawning. Table 3.5-1 lists many of the common fish species found in the St. Maries Watershed. A fish survey of the oxbow habitats within the project area was conducted in August 1999. Oxbow habitat was sampled visually and with electroshocking equipment (Kuzis 2002). Riverine habitat (St. Maries River) was not visually inspected or electroshocked.

Table 3.5-1. Selected Common Fish Species of the St. Maries River Watershed

Species	*Observed in Oxbow Habitats in Project Area August 1999 Survey*	*Observed in St. Maries River Watershed by USFS Surveys (1998-2001)*
Bridgelip suckers (*Catostomis columbianus*)	Yes	
Brook trout (*Salvelinus fontinalis*)		Yes
Northern pike minnows (*Ptychocheilus oregonensis*)	Yes	
Redside shiners (*Richardsonius balteatus*)	Yes	
Shorthead sculpin (*Cottus confusus)*		Yes

Source: Kuzis 2002, USFS 2001a

Aquatic macroinvertebrates are known to occur within oxbows and wetlands within the project area (Kuzis 2002). Although the project area was not surveyed for macroinvertebrates, the following taxonomic groups are identified as potentially occurring within the project area (Kuzis 2002): Ephemeroptera (mayflies), Odonata (dragonflies and damselflies), Hemiptera (water boatmen, backswimmers, water scorpions, etc.), Neuroptera (spongilla flies and alderflies), Trichoptera (caddisflies), Lepidoptera (aquatic moths), Coleoptera (beetles), Diptera (flies), Porifera (freshwater sponges), Cnidaria (Hydra), Nematoda (parasitic roundworms), Gastropoda (snails), Bivalvia (clams), Oligochaeta (worms), Hirudinea (leeches), Hydrachnida (mites), Cladocera (zooplankton), Branchiopoda (tadpole and fairy shrimp), Ostracoda (seed shrimp), Copepoda, and Decapoda (crayfish).

Threatened, Endangered and other Special Status Species

The USFWS identified the bull trout as the only fish species protected by the ESA that may occur near the project area (USFWS 2002). Electrofishing was conducted in oxbows and Hatton Creek

(Kuzis 2002). Special status species that were evaluated for possible occurrence in the project area are described in Table 3.5-2.

Table 3.5-2. Threatened, Endangered, and Special Status Fish Species With Potential to Occur Within or Near the Proposed Project Area

Species	*Status*	*Potential to Occur in St. Maries Watershed*
Bull trout (*Salvelinus confluentus*)	FT, SC	Possible – Bull trout are found in the St. Joe River and may enter the St. Maries watershed during migration.
West Slope Cutthroat trout (*Oncorhynchus clarki lewisi*)	SC	Likely - This species occurs throughout the watershed and has been documented in Emerald and Carpenter Creeks. The upper portions of the tributaries in the ROI contain spawning and rearing habitat.

FT-Federally Threatened; SC-Idaho Species of Special Concern.
Sources: USFS 2001a, Kuzis 2002

No cutthroat or bull trout were observed during the August 1999 fish survey in the project area (Kuzis 2002). The oxbows contained deep silty or clay substrates, warm water, and limited cover. Cutthroat and bull trout prefer clear cold streams with rocky riffles for spawning, and deep, slow pools for resting, feeding, and over-wintering (USFS 2001a). These oxbows may be used as seasonal migration corridors during high flows to the upper reaches of the tributaries (Kuzis 2002). The St. Maries River, and Adams and Olson Creeks provide the only potential habitat in the project area.

3.5.2 Environmental Consequences

3.5.2.1 Alternative 1 – No Action

Under the No Action alternative, mining activities would continue on 77.8 acres of upland. Vegetation would be impacted within this area. Ongoing impacts occurring within the proposed project area from flooding, cattle grazing, recreation, flooding, and impervious surface runoff, would likely continue under the No Action alternative.

3.5.2.2 Impacts Common to All Alternatives

Garnet mining would directly impact fisheries where oxbows are mined. Garnet mining could potentially and indirectly degrade downstream fish habitat through increased sedimentation, channel destabilization, and wetland degradation. Aquatic habitat degradation has been shown to negatively affect viability of fish populations (USFS 2001a). Habitat indicators used in the Garnet Stars and Sands EIS (USFS 2001a) include the amount of riparian habitat removed, increase in sediment, and the amount of channel altered. ECG would use a series of BMPs to control or reduce the potential for impacts outside the area being mined. There would be a 30-foot mining setback along the St. Maries River and siltation berms would be a minimum of 22.5 feet away from the tributaries that are not to be mined. Sediments should be sufficiently controlled to not decrease water quality; however during extreme flood events, overtopping of berms could occur, causing the potential release of sediments to the St. Maries River. Channels would not be directly impacted since streambeds are not being mined. Riparian habitat would not be removed within 22.5 feet of the river and tributaries.

3.5.2.3 Impacts Unique to Specific Alternatives

Impacts to fish are anticipated for all mining alternatives except Alternatives 8, 9, and 10, the oxbow avoidance alternatives. Alternatives 2 and 3 would have greater impacts on fish. Impacts would consist of:

1) Loss of oxbow habitat due to mining activities. Several fish species are known to use oxbows (Kuzis 2002). For any fish species breeding in the oxbows, damage to eggs or disturbance to spawning fish could occur.

2) Loss of potential over-wintering habitat and loss of potential refugia during high water events.

Threatened, Endangered, or Other Special Status Species

Potential impacts to threatened, endangered, or other special status fish species are presented in Table 3.5-3. Alternative 8 is anticipated to have no impact since it avoids all oxbows. Alternatives 2 and 3 would have the greatest potential impact since they impact all of the oxbows.

Table 3.5-3. Potential Impacts to Special Status Fish Species

Species	*Potential Impacts*	*Determination of Effect*[1]
Bull trout (*Salvelinus confluentus*)	Possible - Loss of potential over-wintering habitat and loss of potential refugia during high water events.	May affect, not likely to adversely affect.
West Slope Cutthroat trout (*O. clarki lewisi*)	Possible – Loss of potential over-wintering habitat and loss of potential refugia during high water events.	May adversely impact individuals, but not likely to result in a loss of species viability in the ROI, nor cause a trend to federal listing or a loss of species viability rangewide.

Note: 1. Determination of effect is based on baseline information gathered by Kuzis (2002). The determination for federally threatened and endangered species uses the language required by Section 7 of the ESA.

3.5.3 Mitigation

The application of the mitigation measures described in *Best Management Practices for Mining in Idaho* (IDL 1992) would decrease the potential impacts to fisheries during normal weather conditions. Specific mitigation procedures to minimize potential flood-related impacts include:

- Mining operations would not occur within the OHWL of the St. Maries River. The OHWL would be visually determined in the field by identification of the topographic position where the unvegetated channel meets the vegetated top-of-bank.

- Mining would not occur within 22.5 feet of OHWL.
- Wet mining panels would not be constructed within 30 to 70 feet of OHWL.
- Permanent stream channels crossing the floodplain would not be mined.
- Mining operations would not occur when BMPs proper function is limited by excessive surface runoff.

3.6 Earth Resources

The attributes of earth resources to be considered include the geology, physiology, soil types, and the amounts and location of garnet reserves within the project area. The ROI for earth resources consists of the 327.5 acres of the proposed project. Potential impacts to earth resources are not expected to extend beyond the proposed project area.

3.6.1 Affected Environment

3.6.1.1 Geology and Physiography

Regionally, the project area is located on the western flank of the Northern Rockies where flood basalts of the Columbia Plateau backed up into stream valleys along the western edge of the mountains. Precambrian metasedimentary rocks correlating to the Belt Supergroup underlie most of the vicinity, although some granitic and higher-grade metamorphic rocks are also present (personal communication, Dickman 2002).

Locally, highly metamorphosed Precambrian sedimentary rocks underlie the project area with plutonic outliers of the Idaho batholith dispersed throughout. Dikes and sills of gabbroic and granitic composition are also found in the vicinity. Basalt flows during the Miocene (23.8 to 5.3 million years ago) dammed the St. Maries River causing a lake to form. Sedimentary deposits from this Miocene lake are exposed in several locations throughout the project area (personal communication, Dickman 2002).

The distribution of the garnet resource in the area is controlled by specific geologic parameters. Garnet formation and distribution seems to be controlled by metamorphic gradation from the Idaho Batholith and structural extent of the Precambriam rock formations located along the border of the Batholith. These structures could have been formed in response to the collision and accretion of Permian and early Mesozoic units of the continent producing northeast trending fold axes and northwest trending lineations and fold axes. Intrusion of the batholith and subsequent metamorphism occurred shorthly after in the late Crestaceous (personal communication, Dickman 2002).

The primary contributor to the occurrence of garnet is the type of garnet-bearing parent material. In the project area, this rock formation is the upper schist member of the Precambrian Wallace Formation. The schist was originally deposited as silt approximately 900 million years ago. Erosion and weathering the past 50 million years have transported the resistant garnet into the valley bottoms where it has formed extensive alluvial deposits (personal communication, Dickman 2002).

3.6.1.2 Soil Types

The *Soil Survey of Benewah County Area, Idaho* (Soil Conservation Service [SCS] 1975) and the NRCS Official Series Description (NRCS 2001) were reviewed for information pertaining to the soils in the project area. Proposed mining areas A, E, and B are within active floodplains. While not in the active floodplain, proposed mining areas C, D, and F are within the historic floodplain area (refer to Figure 2-1).

The active and historic floodplains are composed of alluvium derived mainly from schist eroded from its parent Precambrian Wallace Formation. Referred to as the Pokey series, the soil comprises Pokey fine sandy loam (about 60 percent), found on low terraces and Pokey loam (15 percent) found on the floodplains (SCS 1975). Typically found at elevations from 2,200 to 3,100 feet, they have slopes of 0 to 4 percent (NRCS 2001), and have a fine sandy loam surface layer over coarse sand and gravel (SCS 1975). Both Pokey fine sandy loam and Pokey loam have rapid permeability in the lower part of the substratum, have a high water table (12 to 35 inches) from February to June, and are frequently flooded for long periods in spring. Surface runoff is slow, the hazard of erosion is slight, shrink-swell potential is rated as low, and channelization is likely during flooding. Included with these soils are areas of Potlatch silt loam and Aquic Xerofluvents. These soils have 0 to 2 percent slopes, and are very poorly drained. Aquic Xerofluvents have moderately rapid permeability, and Potlatch silt loams have moderate permeability. Included soils make up about 25 percent of the map unit (SCS 1975).

3.6.1.3 Garnet Reserves

Garnet is one of the most common minerals found worldwide in igneous and metamorphic formations of varying age. Garnet is a crystalline structured Orthosilicate, identified by the presence of Si_3O_{12} with additional secondary minerals. The following six varieties of garnet are commonly found throughout the world: Spressarite, Pyrope, Almandine, Uvarovite, Grossularite, and Andrite.

Between 1998 and 2000, the U.S. produced 20 to 30 percent of the industrial garnet mined worldwide. ECG is one of five U.S. garnet-producing companies (Balazik 1998; Olson 1999; Olson 2000). Garnet found within the proposed project area and in the upper St. Maries River watershed is the Almandine variety. It is found in a micaceous schist layer that is the uppermost member of the Wallace Formation. Originally deposited as silt approximately 900 million years ago, erosion and weathering over the past 50 million years have transported the resistant garnet into the valley bottoms where it has formed extensive alluvial deposits. These alluvial deposits are unique in the world in terms of hardness, durability, and size of deposit.

Alluvial garnet concentrations sufficient for commercial mining have been found in Emerald and Carpenter basins, and along the St. Maries River below the confluence with Emerald Creek. Garnet concentration and size vary markedly within the drainages. Concentration variation is tied to unique valley bottom conditions at the time of deposition, as well as variable rates of deposition over time. Coarser garnet is found closer to the source rock. The grade of garnet found in the region ranges from coarse to fine in the following order: East Fork Emerald Creek, West Fork Emerald Creek, Carpenter Creek, and St. Maries River. Coarser garnet is also found in the upper portions of each watershed. Fine garnet is found in greatest quantity in the St. Maries River floodplain, and in the lower portions of each watershed.

In 1998, ECG performed a reserve analysis to estimate garnet reserves on portions of the St. Maries floodplain downstream from the confluence of Emerald Creek. A 200 series Cat hydraulic excavator was used to collect samples, which were processed by ECG staff, under supervision of the reserve analysis author, to determine the garnet content. The garnet-bearing gravel layers in the St. Maries floodplain range from a minimum of 6 feet to in excess of 10 feet (Howard 1998). Overall, 193,930 tons of estimated reserves are located in the 327.5 acres of proposed mining areas, and are the finest minable-concentration grade in the region.

3.6.2 Environmental Consequences

3.6.2.1 Alternative 1 - No Action

Under the No Action alternative, mining activity would continue to affect earth resources within the 77.8-acre upland area. Environmental impacts to earth resources would be short-term impacts as ECG would continue to reclaim mined areas under existing permits.

3.6.2.2 Impacts Common to All Alternatives

Mining activity is not expected to significantly affect the geology and soils of the ROI. Earth movement from excavation activity as part of wet or dry panel mining would have minor short-term direct effects to soils and topography. Erosion and compaction would occur from road building and mining activities. Washed rock or crushed rock would be temporarily placed in wetlands for roads, BMPs, equipment pads, and topsoil/overburden storage. The fill would be placed in un-mined areas and would be removed as the area is mined. Road fill would last one season for haul roads within the mining units. Road fill would last for several years for temporary roads constructed outside the mining units. Temporary road fill would be removed and the road mined when it is no longer needed for access. Excavated material from diversion and interceptor channels, and sediment basins would be temporarily side-cast and used as part of the BMP. Topsoil would be temporarily placed as a siltation berm. Fill for equipment pads would be seasonal, and would be removed as the wet panel migrates within the mining unit. Additional topsoil and overburden would be temporarily stored in each mining unit and re-spread as soon as mining is completed. All temporary fill areas would be re-graded to reclamation design specifications at the conclusion of annual mining activities. In addition, adherence to established BMPs, including siltation berms around active mine sites and stockpiled topsoil, would minimize these direct effects. Reclamation would return the area to near pre-mining conditions. Each alternative would use some of the excavated topsoil for beneficial use.

Soil properties and topographic characteristics of the area create a condition where the risk of soil sloughing is low (personal communication, Haagen 2002). Clay found in the Pokey soil series of the ROI binds the soil together. Slopes in the area range from 0 to 4 percent. The clay property, combined with the slight slope of the ROI makes the potential for landslides remote. Soil properties providing resistance to erosion include a low rating for shrink swell potential and low ratings for erosion factors such as water erosion susceptibility for rock free soil and water erosion susceptibility for soil with rock (NRCS 2002).

3.6.2.3 Impacts Unique to Specific Alternatives

The environmental consequences for earth resources discussed above are expected to be the same for all action alternatives. While the amount and extent of physical disturbance may be different among alternatives, their differences are not appreciable with regard to this resource.

3.6.3 Mitigation

3.6.3.1 During Mining

Mitigation to avoid and reduce environmental impacts to earth resources during mining activity includes application of BMPs established in *Best Management Practices for Mining in Idaho* (IDL 1992). ECG design criteria would be implemented to meet or exceed IDL standards.

The following BMPs, along with respective design requirement references from IDL (1992), would be used to prevent potential direct and indirect resource impacts:

- Siltation berms (BMP III.4) would be installed around annual mining units to capture and contain surface runoff within the mining unit;
- Stabilization seed mix (BMPs II.3, II.4, II5, and II.9) would be used for siltation berm stabilization, interceptor and diversion channel stabilization, and upland revegetation;
- Catch basins (BMP V.2) would be used along temporary roads to detain stormwater, capture the sediment load, and prevent degradation of stream and river water quality; silt fencing and straw bales (BMP V.4) installed to prevent sediment from entering a specific area;
- Interceptor channels (BMP III.2) upslope of the mining unit would collect overland runoff and convey it around the mining unit;
- Diversion channels (BMP III.1) upslope of the mining unit would collect overland and tributary flow and convey it around the mining unit;
- Sediment basins (BMP V.6) at the downstream end of all interceptor and diversion channels would detain runoff from 25-year, 24-hour storm events for a 0.5 square mile area to allow settling of suspended sediments and to allow trapping of organic matter; and
- Vegetated biofilter strips (BMP V.2) would be used at the outflow of sediment basins and adjacent to temporary roads to slow storm water, trap sediments, and biofilter surface flow before it enters a stream or river.

Temporary roads and haul roads would be constructed to meet or exceed the minimum requirements of BMP III.11 (IDL 1992). Roads would be mined as the mining unit they access is completed. They would then be recontoured and planted, and would no longer provide access to the mined areas.

3.6.3.2 Post-Mining

The proposed Reclamation Plan provides for reclamation for earth resources impacts (refer to Volume II Appendix A) and contains detailed discussions relating to reclamation for earth resources. The plan includes:

- Mining BMPs would remain in place through the first high flow season after mining has been completed during final grading to allow the normal hydrologic cycle to resume.
- Reclamation BMPs would be placed on the re-graded mining unit after mining BMPs are removed, and would be maintained through a second high-flow season.
- Topsoil would be spread to final grade and the mining unit seeded the first summer season after mining is completed.

3.7 Land Use and Ownership

The attributes of land use to be addressed include land ownership and general land use patterns, plans, and special use areas. Land ownership, also referred to as land status, is a categorization of land according to type of owner. The major land ownership categories discussed include federal, state, and private land. Natural land use classifications include wildlife areas, parks and other open or undeveloped areas. Human land uses include residential, commercial, industrial, utilities, agricultural, recreational, mining, and other developed uses. General land use classifications are identified in the vicinity of the St. Maries project area. Plans prepared by federal, state, and local agencies have been reviewed and analyzed. The ROI for land use includes the area comprising the ECG project area as well as properties directly adjacent to the project site.

3.7.1 Affected Environment

3.7.1.1 Land Use

The proposed mining areas are in the St. Maries River basin, approximately 1 to 4 miles south of the unincorporated town of Fernwood. The 327.5-acre site is primarily situated on the southwest side of Highway 3 and northeast of the St. Maries River. The St. Maries River railroad line also traverses the property. There are six proposed mining areas within the project area. Mining Areas C, D, and F are located in existing floodplain immediately adjacent to the St. Maries River. Mining Areas A, E, and B are located in non-floodplain areas and in the historic floodplain of the St. Maries River. These areas have been truncated from the active floodplain by the construction of Highway 3 and the St. Maries River railroad line. Current ECG mining operations occur on 77.8 acres in the upstream end of the project area. ECG also holds mining permits outside the project area.

ECG facilities within the mining area include a caretaker house, finished ECG facilities in the project area include product storage, a track vehicle repair shop and a large structure with office, assay, and repair shop. ECG facilities adjacent to, but outside, the mining area include a mill, a storage building and a dwelling (east of the highway). Corrals are located in mining Area D.

The project area is predominantly used for grazing. Cattle grazing during the summer and fall months has occurred annually for more than 50 years. Recently cattle have been removed from some acreage to allow for harvesting of cash hay crops (personal communication, Carroll 2002). No improved recreational uses occur on or immediately adjacent to the site, however informal hunting activity occurs by permission of the property owners. Hunting includes deer and elk in season (personal communication, Carroll 2002).

Timbered lands on surrounding properties support timber activities (adjacent property owners include IDL and Potlatch Corporation) and seasonal grazing. Forested areas dominate the landscape and have influenced the regional land use pattern, with mining as an acknowledged traditional land use. In addition to commercial mining, area visitors enjoy digging of gemstone garnets (USFS 2001a). This recreational activity supplements other such activities in the vicinity of the project area including hunting, fishing and sightseeing. Numerous campgrounds occur throughout the valley within proximity of historic trails, and logging and mining camps. They offer opportunities for gathering forest products and otherwise enjoying abundant natural resources. The campground nearest to the project area is the USFS East Fork Emerald Creek campground approximately six miles west of the project area. Residential use on surrounding properties consists of scattered residential dwellings associated with grazing and farming. The nearest population center (approximately 300 residents) is the unincorporated town of Fernwood. Fernwood also supports some commercial uses, a fire station, and a campground.

Approximately 95 percent of the project area lies within Benewah County. A small eastern tip of the project area is within Shoshone County. The current and proposed use for the project area is consistent with both county plans (personal communications, Malland 2002, Hicks 2002). Private lands are regulated by county ordinances. In Benewah County, the project area is unzoned, but Uniform Building and Mechanical codes and floodplain and subdivision ordinances do apply. Shoshone County has zoned the area as a natural resource district where the proposed use (mining) is principally permitted.

3.7.1.2 Land Ownership

Figure 3.7-1 depicts land ownership in the project region. Land within the project area is privately owned. Although public lands comprise approximately 80 percent of the land area of Shoshone County, in Benewah County about 20 percent of the land area is held by public entities. There are no federal lands surrounding the project area. The USFS manages large acreages to the south of the project area within the St. Joe Ranger District. The only property adjacent to the site that is not privately held is State of Idaho property, currently used for timber activities (personal communication, McNary 2002).

ECG owns 105.7 acres of the 327.5-acre project area. Table 3.7-2 reflects ECG's ownership within the proposed mining areas (refer to Figure 2-1). The remaining 221.8 acres is privately held. Under all of the proposed alternatives, the current owners would lease their property to ECG.

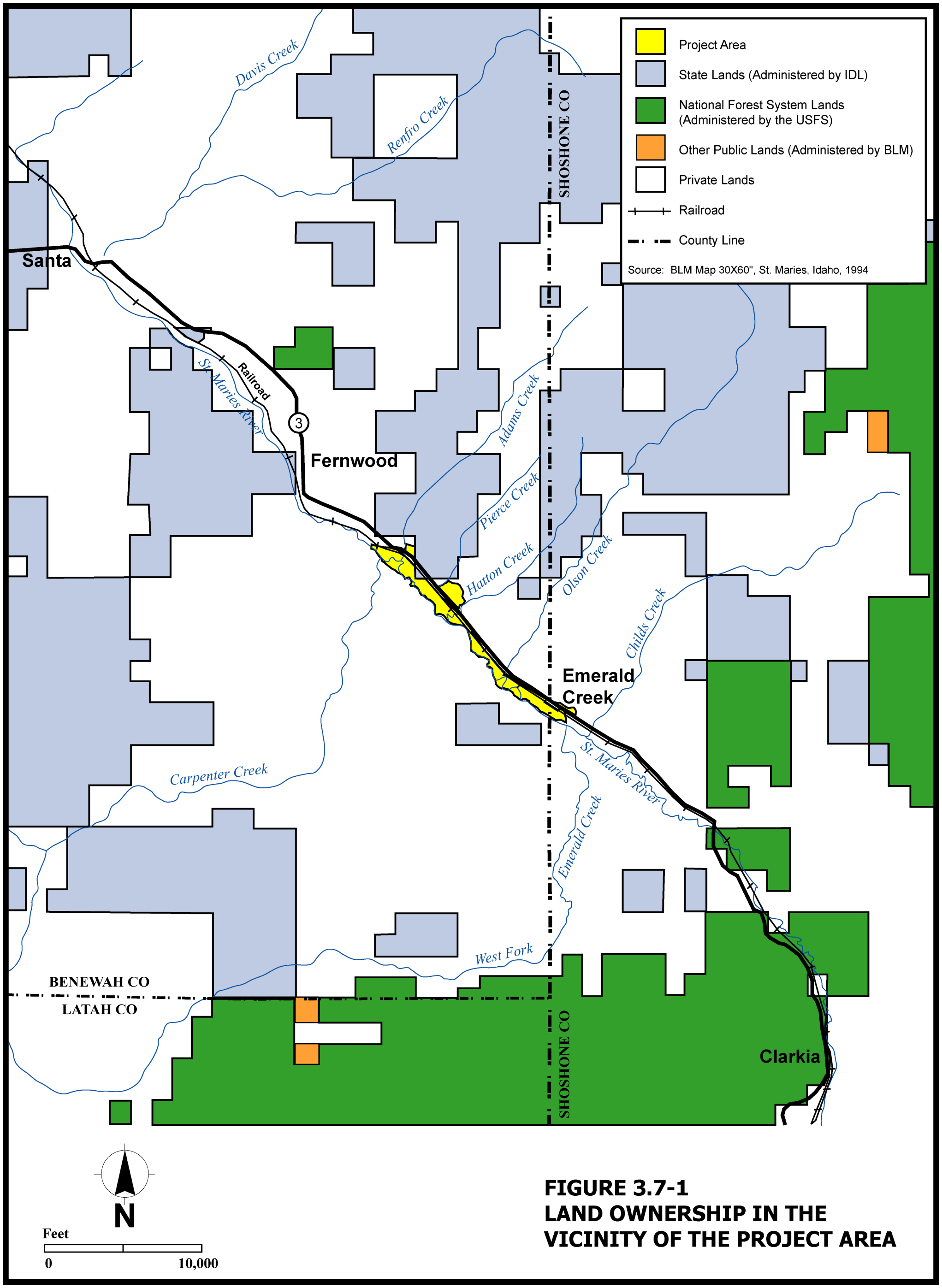


FIGURE 3.7-1
LAND OWNERSHIP IN THE VICINITY OF THE PROJECT AREA

Table 3.7-2. ECG Ownership

Mining Area	*ECG Acreage*
A	1.2
B	10.5
C	39.0
F	55.0
Total	**105.7**

Lease agreements would be established with four private property owners. During the time that ECG is mining, the landowner would effectively yield control and use of the property during active mining and reclamation. The lease agreements would be characterized by basic terms and conditions including durations of approximately five years, provisions for protective fencing, and controlled access. The lease agreement would also establish compliance with all local, state and federal regulations, specifically USACE requirements pertaining to mining within the mining permit areas (personal communication, Osburn 2002).

3.7.2 Environmental Consequences

3.7.2.1 Alternative 1 – No Action

Under the No Action alternative, mining activities would continue on 77.8 acres of upland. Impacts to land use are not expected under the No Action Alternative. The current land use patterns of mining, timber, and grazing activity would remain unchanged. Land ownership would continue as privately-held without lease agreements. The current use of the property is consistent with county plans and ordinances. ECG would continue to mine, reclaim, and rehabilitate the disturbed land. Any future use or development of the property would comply with appropriate local ordinances.

3.7.2.2 Impacts Common to all Alternatives

Impacts to land use are not expected under any of the alternatives. Although the use of most of the project area would temporarily change from grazing to mining, mining is an established use within the region. The proposed use is consistent with all applicable plans and ordinances. Once the proposed mining activities are complete, the area would be reclaimed. At that time, grazing or other agricultural use would resume. Any use or development of the property would comply with appropriate local ordinances. Land ownership would not change under any of the alternatives.

3.7.2.3 Impacts Unique to Specific Alternatives

Permanent impacts to land use are not expected under any of the alternatives. Although use of most of the project area would temporarily change from grazing to mining, mining is an established use within the region. The proposed use is consistent with all applicable plans and ordinances. Land ownership would not change under any of the alternatives

3.7.3 Mitigation

Since land use impacts are not anticipated, mitigation measures have not been developed.

3.8 Traffic, Transportation, and Access

Transportation resources are defined as the infrastructure and equipment required for the movement of people, raw materials, and manufactured goods in geographic space. These resources may include highway and rail networks, airport and port facilities, and passenger and freight transport services. For the proposed action, the primary transportation use focuses on the roadway network supporting mining operations. This section provides a general description of the major vehicular travel routes that serve the project area, as well as a summary of the most current traffic volume and accident information provided by the Idaho Transportation Department (ITD). The ROI for traffic, transportation, and access consists of the roads and highways used to support mining operations between Fernwood and Clarkia; primarily State Highway 3 and the Benewah and Shoshone county roads.

3.8.1 Affected Environment

The major roadways that serve the project area are State Highway 3, Emerald Creek Road and Carpenter Creek Road. Current use of these routes includes vehicle and truck traffic for recreation, logging, and mining activities.

State Highway 3 generally follows a north-south alignment that meanders through a rural area of northern Idaho and provides a connection between Interstate 90 and U.S. Highway 12. State Highway 3 serves local and regional travelers including drivers of commercial logging trucks, tourists and recreational users, and residents of several small communities along the highway. State Highway 3 bisects the ROI lengthwise along a 3.2-mile long northwest-southeast alignment, generally parallel to that of the St. Maries River. Within the project area, State Highway 3 is a rural, two-lane paved road with a posted speed limit of 55 miles per hour (mph). Numerous access points from the ECG mining site to Highway 3 already exist. These access points are shown on Figure 3.8-1.

Emerald Creek Road is a two-lane unpaved roadway that is currently used by ECG for their mining activities. From State Highway 3, approximately 3.5 miles of Emerald Creek Road is a county road. After that, the road becomes a Forest Service road (FR 447) and provides access to the Emerald Creek Campground and to other forest roads in the area (personal communication, Radcliff 2003). Carpenter Creek Road is an unpaved, two lane rural roadway. Potlatch Corporation operates logging trucks on Carpenter Creek Road, including the segment of this roadway that would be used by mine-operated dump trucks. This road is also used by ECG for current mining activities.

For the year 2000, the average daily (24-hour) traffic (ADT) volumes on the 8.5-mile segment of State Highway 3 between Clarkia and Fernwood was 950 vehicles (ITD 2002a). The year 2000 and the seven-year and twenty-two-year traffic volume forecast data are summarized in Table 3.8-1. These data indicate that traffic volumes on this short segment of State Highway 3 are expected to increase from a year 2000 ADT of 950 vehicles per day to 1,070 by year 2007, and then to 1,322 by year 2022 (ITD 2002b). During this same 22-year time period, the percentage of heavy vehicles (including large trucks and recreation vehicles) is expected to increase from 23.2 to 25.9 of the traffic traveling on this segment of State Highway 3 (ITD 2002b). ITD also indicates that State Highway 3 experiences lowest volumes during the spring, and highest volumes during the late summer and fall due to increases in logging and recreational activity.

Table 3.8-1. State Highway 3 Between Fernwood and Clarkia ADT Volume Projection Screen - Years 2000, 2007 and 2022

	2000		*2007*		*2022*	
State Highway 3 Segment	*ADT*	*% Heavy Vehicles*	*ADT*	*% Heavy Vehicles*	*ADT*	*% Heavy Vehicles*
Fernwood to Clarkia[1]	950	23.2	1,070	24.2	1,322	25.9

Note: 1. Length of Road = 8.5 miles
Source: ITD 2002a; ITD 2002b

In general, traffic is considered to operate at a congested level of service when a roadway's volume reaches 90 percent of its capacity ($V/C \geq 0.9$). The volume-to-capacity ratio (V/C) for the study area segment of State Highway 3 ranges between 0.09 and 0.13 (ITD 2002c). This segment of State Highway 3 is not presently congested, and it is not anticipated to approach congested levels over the next 20 years.

Emerald Creek and Carpenter Creek Roads support very low volumes of recreation and logging traffic with some seasonal variations. The majority of traffic occurs on these roadways between April and September. These roads are typically closed to all traffic, except for snowmobiles during the winter months. ITD accident data for a 8.5 mile segment of State Highway 3 extending between the communities of Fernwood and Clarkia over a five-year period between 1996 and 2000 inclusive indicates that the total number of accidents decreased from four in 1996 to three in 2000 (ITD 2002d). The average number of accidents within this segment over this five-year period was 3.4. Over half (65 percent) of the accidents that occurred along this segment of State Highway 3 during this five-year period were categorized as "property damage." One of the accidents resulted in a fatality, and the remaining accidents resulted in various degrees of injury (ITD 2002d). The statewide collision rate per 100 million annual vehicles miles of travel on Idaho State System (non-interstate) roads was 42.9, 41.0, and 44.3 for years 1998 through 2000 (ITD 2001). The accident rate on State Highway 3 was substantially lower than the statewide average for each of the five most recent years.

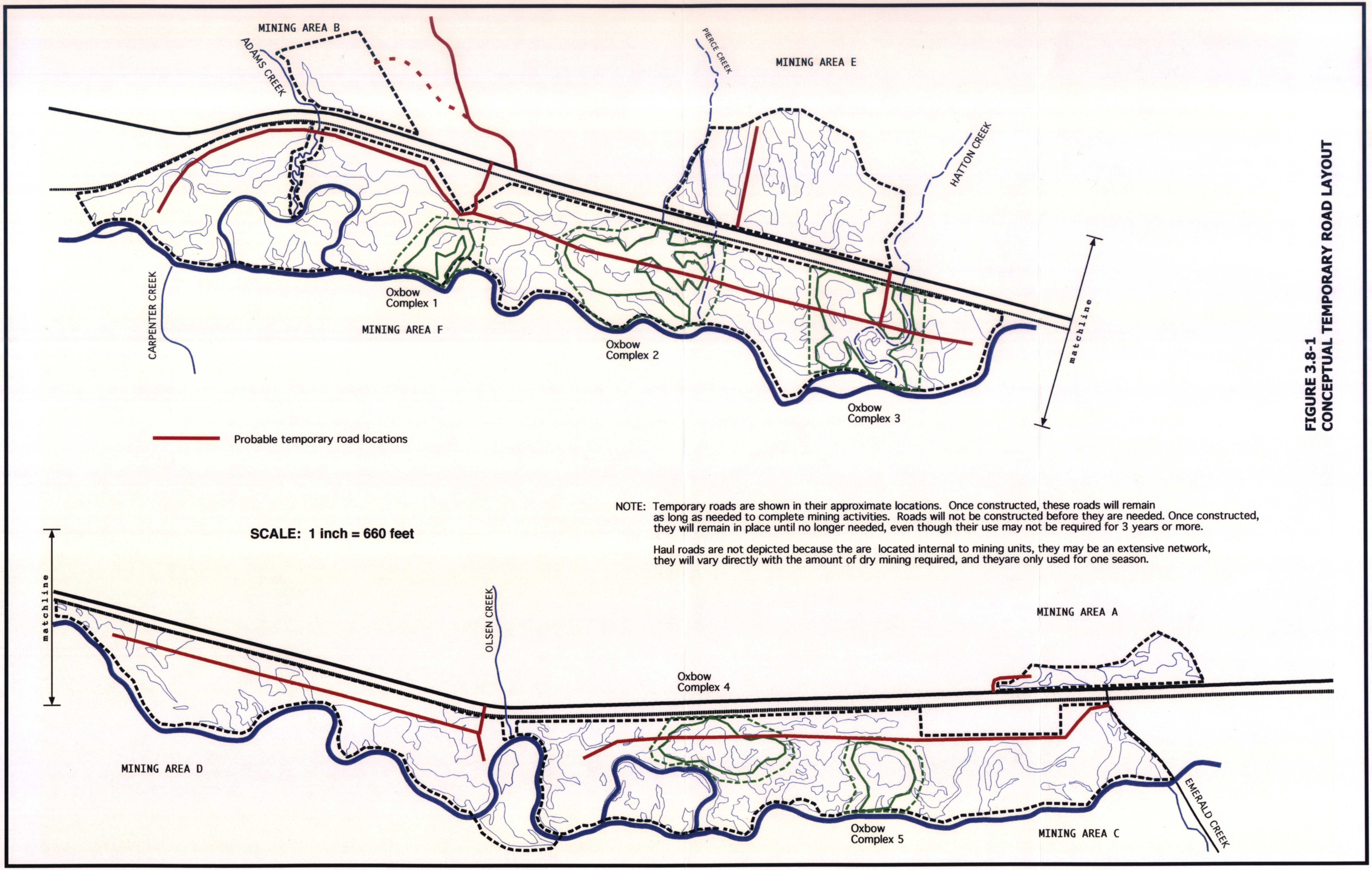
3.8.2 Environmental Consequences

This section provides a description of impacts to the existing regional and local roadway system as a result of the proposed action and alternatives.

3.8.2.1 Alternative 1 – No Action

Under the No Action alternative, mining activities would continue on 77.8 acres of upland. Truck use and haul trips would continue to occur as they do today. This would include construction of additional haul roads and temporary roads. Once the area has been completely mined, the haul roads and temporary roads would be closed and reclamation of the disturbed area would occur.

FIGURE 3.8-1
CONCEPTUAL TEMPORARY ROAD LAYOUT



NOTE: Temporary roads are shown in their approximate locations. Once constructed, these roads will remain as long as needed to complete mining activities. Roads will not be constructed before they are needed. Once constructed, they will remain in place until no longer needed, even though their use may not be required for 3 years or more.

Haul roads are not depicted because the are located internal to mining units, they may be an extensive network, they will vary directly with the amount of dry mining required, and theyare only used for one season.

3.8.2.2 Impacts Common to All Action Alternatives

Proposed mining activities and operations would require two actions that could directly affect traffic service levels, safety conditions, and the physical condition of existing roadways in the study area. These two actions are: 1) the addition of new temporary roads and haul roads and, 2) the addition of truck and employee traffic to the existing and proposed roadway system.

State Highway 3 would serve as the primary access road for ECG mine-operated trucks hauling materials to and from the site, and for mine employees. Traffic-related impacts under all action alternatives would result from additional truck trips relative to existing "background" traffic that normally occurs on State Highway 3, Emerald Creek Road, and Carpenter Creek Road within the ROI. Impacts to segments of State Highway 3 that would be used by mine-related trucks and other employee traffic traveling outside the study area to other regional and interstate destinations are likely to be negligible relative to existing and projected traffic that would otherwise occur on these routes. Additional access roads from Emerald or Carpenter Creek roads would not be required. Trucks would continue to use existing access points along these roads. The addition of intersections would likely result in a minor impact upon the existing and projected traffic service levels on the affected roadways.

Within the ROI, dump trucks hauling extracted garnet-laden material would travel along the 3.2-mile segment of State Highway 3 between Emerald Creek and Carpenter Creek Roads, and along short segments of each of the two local forest roads between different mine units, and between mine units and a jig plant located within Emerald Creek and Carpenter Creek basin. These trucks would then travel to a mill located on the existing ECG mining site. The hauling trip requirements are based on annual production of 30,000 tons of garnet. All alternatives have the same number of hauling trip requirements: three to seven loads per washer per day.

Addition of hauling trucks may have a minor effect upon the existing traffic operating conditions along the segment of State Highway 3 between Emerald Creek and Carpenter Creek Roads, at the intersections of State Highway 3 with each of these two roads, and along the segments of Emerald Creek and Carpenter Creek roads where the mine trucks would travel. The addition of the new trucks to roadways which support low traffic volumes would not make an impressionable difference in traffic volumes and would not likely cause congestion along the affected roadway segments and intersections. However, the relatively slower speeds of these vehicles could occasionally impede the normal traffic flow along the affected roadways.

Due to the high number of variables (e.g., variations in vehicle mix, weather/road conditions, other events) involved, evaluating and predicting accidents is difficult if not impossible. However, due to the relatively low existing and forecast ADT volumes and V/C ratios on State Highway 3 and the forest roads, any potential increase in conflicts between mine-related vehicles and other roadway users is not likely to be significant. The increase in heavy vehicle traffic associated with the mine operation could slightly accelerate the physical degradation of existing roads that would be used by the mine-generated trucks. This increase in heavy vehicle traffic could also contribute to the need for more frequent roadway maintenance and/or an improvement of new pavement necessary to accommodate increased vehicle weights. These potential effects would result in an increase in maintenance costs.

3.8.2.3 Impacts Unique to Specific Alternatives

Potential impacts could occur from the increase in improved access points associated with construction of temporary roads under several alternatives. In general, no additional access points would be required for any alternative. Improved, existing access points would need right-of-way agreements, permits, and road construction (Table 3.8-2). Refer to Figure 3.8-1 for the location of these access points. The addition of improved access points would increase the number of potential conflicts between vehicles at the new intersection locations. While these access points could create additional traffic and safety concerns, the low traffic volumes would be unlikely to affect traffic congestion. Due to the relatively low volumes of traffic using the roadways within the study area, the traffic service and safety impacts resulting from the addition of temporary roads are expected to be minimal.

The duration of hauling over the life of the project would be reduced for Alternatives 8, 9, and 10 because of the reduced number of acres of garnet mined under these alternatives (refer to Table 3.8-2).

Table 3.8-2. Trip Requirements and Access Points to State Highway 3

Alternatives	*Hauling trip requirements*	*Improved Access Points Used*	*Reduced Months of Trip Requirements*
Alternative 1: No-Action	N/A	N/A	N/A
Alternative 2: 12-month wet panel	3-7 loads/day/washer	7	–
Alternative 3: 12 month wet/dry panel	3-7 loads/day/washer	7	–
Alternative 8: Oxbow Avoidance Alternative (84.3 acres of wetland mined)	3-7 loads/day/washer	6	39
Alternative 9: Oxbow Avoidance Alternative (96.9 acres of wetland mined)	3-7 loads/day/washer	6	25
Alternative 10: Oxbow Avoidance Alternative (108.9 acres of wetland mined)	3-7 loads/day/washer	7	16

Source: ECG 2002

3.8.3 Mitigation

3.8.3.1 Prior To and During Mining

Access to each mining unit would be via temporary roads. Temporary roads are constructed to support mining activity and remain for the duration of that activity. Since the temporary roads would not create a traffic impact, mitigation measures are not required. However, road designs include installing culverts to convey water under the roads and prevent blockage of water channels. Straw bales, silt fencing, and erosion control seed mixes would be used to prevent water quality degradation. Haul roads would not be constructed over the siltation berms to prevent a weak or low area in the berm from being created. A complete description of best management practices used to prevent impacts is found in Volume II Appendix A.

3.8.3.2 Post Mining

Temporary and haul roads would be closed after mining has been completed. Reclamation of these roads would be the same as for the mining area. This includes regrading the surface soil, seeding the area, and planting woody plant species. The Reclamation Plan (Volume II Appendix A) provides detailed information on action items and a schedule to return the land area to its pre-mining state.

3.9 Cultural Resources

Cultural resources are any prehistoric or historic district, site, or building, structure, or object considered important to a culture, subculture, or community for scientific, traditional, religious or other purposes. Cultural resources include archeological resources, historic architectural and engineering resources, and traditional resources. Archaeological resources are areas where prehistoric or historic activity measurably altered the earth or where deposits of physical remains (e.g., arrowheads, pottery, etc.) have been discovered. Architectural and engineering resources include standing buildings, districts, bridges, dams, and other structures of historic or aesthetic significance. Traditional resources can include archaeological resources, structures, neighborhoods, prominent topographic features, habitats, plants, animals, and minerals that Native Americans or other groups consider essential for the preservation of traditional culture.

Impacts to cultural resources are assessed by comparing the proposed action to significant identified or potential cultural resources within the area of potential effect (APE) for that action. The APE for the proposed action and alternatives is the project area.

3.9.1 Affected Environment

3.9.1.1 Historical Setting

Aboriginal land use of the project region probably dates to at least 12,000 years ago (Roll and Hackenberger 1998). Inhabitants of the region are likely to have followed a foraging pattern, living in small groups and using a diversity of canyon and upland floral and faunal resources (including large game animals) as encountered. As the climate gradually warmed, shifts in subsistence practices are represented by small campsites along the rivers and streams of the region. Game such as deer, elk, rabbits, birds, and fish were taken locally. The presence of manos and milling stones indicate the regular use of plant resources. Following forestation of the region by about 4,000 years ago, the settlement pattern shifted to reflect increased use of the grassy valleys and mountain clearings (Roll and Hackenberger 1998). Group mobility decreased and residential villages were established along lakes and rivers. After about 2,000 years ago, the bow and arrow were introduced and permanent winter villages were established in a climate similar to that of today. After about 500 years ago dwellings shifted to more portable structures as larger groups of people gathered in fewer locations. Eventually Euroamericans entered the region, beginning a new era in regional history.

The project area lies within the aboriginal territory of the present-day Coeur d’Alene Tribe (Coeur d’Alene Tribe 2002). Ethnographers record the Coeur d’Alene people occupying an area of mountains and heavy forests centered on Lake Coeur d'Alene and the St. Joe and St. Maries Rivers, and extending as far south as the headwaters of the Clearwater River region. The people wintered in permanent villages on the lakes and rivers of the region (Hudson et al. 1981). Semi-permanent camps were located in major root-gathering (camas prairie) areas. Smaller groups picked berries and hunted and fished in the uplands (Palmer 1998). Canoe travel took place along the relatively flat waterways of the St. Joe and St. Maries Rivers.

Non-settled lands in Oregon Territory were opened to Euroamerican settlement following the passage of the Donation Act in 1850. By 1857 frictions between Euroamerican settlers and Native Americans increased as the food supply decreased. Alliances were formed among the Coeur d'Alenes, the Spokanes and other native groups to protect their lands from further encroachment (Spokane Tribe 1998). During the 1860s, the U.S. government set aside a reservation for the Coeur d'Alenes and other Native Americans in northern Idaho. The parcel consisted of about 250,000 acres extending to the Idaho-Washington border (Wilson n.d.). Following the passage of the Indian Reorganization Act of 1934, the Coeur d'Alenes developed tribal councils and a constitution.

Euroamerican fur traders moved in to the region following the Lewis and Clark expedition along the Clearwater River, south of the project area, in 1804. Fur traders established regional posts beginning in 1807. Miners began entering the region when gold was discovered during the late 1850s and Shoshone County was established in 1864. The miners used trails through the valley of the Coeur d'Alene River and along the northeast side of the St. Maries River (Hudson et al 1981). Gold, silver, lead, and zinc discoveries in the Coeur d'Alene River valley in the 1880s created an economic boom for the region. Most settlement in what is now Benewah County occurred after gold was discovered near St. Maries. After a 1900 gold discovery at Tyson Creek, hundreds of prospectors explored the tributaries of the St. Maries River in the project vicinity for placer gold.

The communities along the St. Maries River were established as lumber towns. The first sawmill in the community of St. Maries was built in 1889 (Hutchison 1938). The area was heavily logged for yellow pine, and logs were floated to mill along the St. Maries and St. Joe Rivers, and on Lake Coeur d'Alene. Clarkia and Fernwood (originally Fennwood) were both lumber boom towns. White pine and cedar logs were floated down the St. Maries River to the lake from lumber camps in all the drainages in the area, including Emerald Creek and Carpenter Creek. The remains of splash dams are still visible in Emerald Creek. Weyerhauser (later Potlatch Corporation) sent logs downstream to mills in St. Maries and other communities beginning in 1910.

In 1909, the Coeur d'Alene Indian Reservation was opened for settlement and a land rush ensued, bringing a further increase in population. Benewah County was created in 1915 from the southern part of Kootenai County (Boone 1988). The railroad also arrived in 1909, stimulating further growth in the region (St. Maries 1998). A branch line was laid south along the St. Maries River to Elk River (Hudson et. al 1981). Before the advent of truck hauling in the mid-1920s, numerous logging railroads crossed the region. The St. Maries River area was served by at least six lumber company rail lines between the 1910s and the late 1920s (Hudson et al. 1981). The timber industry flourished until the late 1920s when work began slowing throughout the region. The industry remained depressed until the late 1930s when armament needs for World War II boosted production once again (St. Maries 1998). Work in the region during the 1930s resulted in the establishment of Civilian Conservation Corps (CCC) camps such as those along Emerald Creek (Camp F-42) and Olson Creek (Camp F-46) (Hudson et al. 1981: Appendix E).

3.9.1.2 Cultural Resources Investigations

Records of the State Historic Preservation Office (SHPO) indicate that no prior archaeological surveys had been conducted in the project area or within one mile surrounding it, and no archaeological or historical sites had been recorded there. Extensive archaeological surveys and excavations have taken place in the Clearwater River drainage to the south of the project area, in what was traditionally Nez Perce territory (Sappington 1995). An archaeological survey of the project area, in compliance with Section 106 of the National Historic Preservation Act (NHPA), was conducted in 1999 (SAIC 1999). The survey located one historic resource, the remains of a rail line and footbridge (10BW150), and two isolated historical artifacts. All three resources were determined to be ineligible for the National Register of Historic Places (NRHP). The SHPO has concurred with the eligibility determinations (refer to Volume II Appendix K).

No traditional resources have been identified in the project area. The Coeur d'Alene tribal website noted two cultural sites along the St. Maries River south of the town of St. Maries (Coeur d'Alene Tribe 2002), but these are outside the present project area. The USACE has initiated government-to-government consultation with the Confederated Salish and Kootenai Tribes of the Flathead Reservation, the Coeur d'Alene Tribal Council, the Spokane Tribe of the Spokane Reservation, the Kalispel Indian Community of the Kalispel Reservation, and the Nez Perce Tribal Executive Committee regarding the proposed action.

3.9.2 Environmental Consequences

3.9.2.1 Alternative 1 - No Action

Under this alternative, mining activities would continue in 77.8 acres of upland area. Impacts to cultural resources are not expected under the No Action alternative. No cultural resources have been identified in the project area.

3.9.2.2 Impacts Common to All Alternatives

Impacts to archaeological or architectural/engineering resources are not expected under any of the alternatives. The presence of intact surface remains in the project area is unlikely due to frequent high floods along the river. No significant (NRHP-eligible) resources were identified during intensive archaeological survey of the entire project area (SAIC 1999). Resources located during survey consisted of three isolated historical artifacts and one historic site (remnants of bridge footings). All four resources were determined ineligible for the NRHP. The Idaho SHPO has concurred with these evaluations (Volume II Appendix K). In the event of inadvertent discoveries of archaeological resources during the mining process, all mining would stop and the SHPO would be contacted to evaluate the find.

No traditional resources have been identified in the project area. The USACE has initiated government-to-government consultation with the Confederated Salish and Kootenai Tribes of the Flathead Reservation, the Coeur d'Alene Tribal Council, the Spokane Tribe of the Spokane Reservation, the Kalispel Indian Community of the Kalispel Reservation, and the Nez Perce Tribal Executive Committee regarding the proposed action.

3.9.2.3 Impacts Unique to Specific Alternatives

As indicated in section 3.9.2.2, impacts to cultural resources are not expected under any of the alternatives. However, the possibility of inadvertent discoveries of deeply buried cultural resources, if any exist in the area, would be greater under Alternatives 2 and 3 because more acreage would be mined. The mining of less acreage (Alternatives 8, 9, and 10) would decrease the potential for inadvertently encountering buried cultural deposits.

3.9.3 Mitigation

If significant cultural resources are inadvertently encountered during the mining process, mitigation measures would be developed in consultation with the Idaho SHPO and interested Native American groups. The SHPO has also recommended that the mine area be monitored once a year by a professional archaeologist, and that training be provided to mining crews "to heighten their awareness of cultural resources and ability to identify archaeological materials" (refer to Volume II Appendix K).

3.10 Socioeconomics

Socioeconomics refers to a number of resources that include economic activity (employment and earnings); population; housing; and public finance. The ROI is defined as the geographical area within which the majority of potential direct and indirect impacts associated with implementation of the project would be experienced. For purposes of this socioeconomic assessment, the ROI is a two-county area comprising Benewah and Shoshone counties. Given the relatively rural nature of these counties, it is likely that a large share of any project effects would be experienced in the communities located within the counties.

3.10.1 Affected Environment

A socioeconomic technical report (Volume II Appendix J) has been prepared to support this DEIS. This section summarizes the data presented in the report.

3.10.1.1 Economic Activity

Natural resource-based industries play a primary role in the economies of the two-county ROI, as they do in the entire state of Idaho. Production of forest and wood products provides the foundation for the Benewah County economy. County civilians employed in all industries as reported by the United States Bureau of Labor Statistics (BLS) grew from 3,149 to 3,891, or 23.6 percent, from 1990 through 2000. Major employers include Potlatch Corporation (wood products mill), Joint School District No. 41, Crown Pacific, Regulas Wood Products Companies, Jack Buell Enterprises (freight), and the Coeur d'Alene Tribe. The Coeur d'Alene Indian Reservation, home of the Coeur d'Alene Tribe, is partially located in Benewah County.

While mining is the traditional economic foundation of Shoshone County, tourism and recreation are growth sectors. Total civilian employment in the county grew from 5,503 to 5,823 or 5.8 percent from 1990 to 2000. Major employers include Sunshine Mining Company, Hecla Mining Company, Silver Valley Labs, Shoshone Medical Center, and Magnuson Enterprises.

Employment

The full- and part-time civilian labor force in the ROI amounted to 10,992 individuals in 2000, with an average unemployment rate of 11.6 percent. Unemployment rates ranged from 11.1 percent to 12.4 percent in Shoshone and Benewah counties. Civilian employment in Benewah County (3,891 persons) is centered in St. Maries, with about half of the jobs located in its environs. Civilian employment in Shoshone County (5,823 persons) is dispersed throughout the county, however Kellogg is the community providing the most jobs. Shoshone County has the largest mining industry presence in the ROI with 769 mining jobs, both metallic and non-metallic, in 1999. Employment data for previous years showed mining employment figures of less than 100 in Benewah County. Mining accounts for close to 12 percent of total employment in Shoshone County, representing the fourth largest sector after services, retail trade, and state and local government. It should be noted that a number of the jobs reported in the manufacturing sector are associated with mineral processing operations, therefore the mining sector alone does not fully account for all jobs associated with the minerals industry in Idaho.

Income and Earnings

Earnings in the ROI totaled approximately $448 million in 2001 (Bureau of Economic Analysis [BEA] 2003). The distribution of earnings across industries is essentially the same as the distribution of employment, with state and local government, services and retail trade representing the largest income producers. Average earnings per job for the ROI were $20,109. Employment in the mining industry provided the highest average earnings per jobs of any sector, amounting to $22,840 per job in Shoshone County.

In 2001, Benewah County had a per capita personal income (PCPI) of $21,029. This PCPI was 86 percent of the state average, $24,506, and 69 percent of the national average, $30,413. Shoshone County had a PCPI of $19,188 in 2001. This was 78 percent of the state average and 63 percent of the national average. According to the State of Idaho in 1999, median household income in Shoshone County was $31,662, compared to the 2000 estimate from the U. S. Census for the state and national median income of $37,210.

3.10.1.2 Population

The ROI contained 22,942 persons in 2000, an increase of approximately 4.9 percent from the 1990 figure of 21,868 (see Table 3.10-1). The population in the ROI accounted for about 1.8 percent of the Idaho population of 1.294 million persons in 2000.

Table 3.10-1. Selected Demographic Information by County

	Benewah	*Shoshone*	*ROI*
1990 Population	7,937	13,931	21,868
2000 Population	9,171	13,771	22,942
1990 – 2000 Growth	15.5%	-1.1%	4.9%
2000 Population Density	11.8/sq.mi.	5.2/sq.mi.	12.9/sq.mi.
2000 Households	3,580	5,906	9,486
2000 Household Size	2.52	2.30	2.42

Source: U.S. Bureau of the Census 2002a

3.10.1.3 Housing

According to the 2000 Census, there were 9,486 housing units in the ROI, of which 16,639 were occupied. An estimated 10,482 of the occupied units were owner-occupied (63.0 percent), while the remaining 6,157 were renter-occupied (37.0 percent). There were 1,437 vacant units, which includes recreation homes, seasonal homes, and other housing classifications. Over one third of the total housing in the ROI is located in Benewah County (37.5 percent), with Shoshone county accounting for almost 62.5 percent.

In 2000, vacancy rates in the ROI ranged from 15.5 percent in Benewah County to 16.3 percent in Shoshone County. Of the vacant units, 53 percent were for seasonal, recreational or occasional use in Benewah County and 33 percent in Shoshone County.

The median value of housing units in 1990 ranged from $32,641 in Shoshone County to $43,964 in Benewah County, compared to the state median home value of $57,980. Median rent in the ROI were about $240 per month, compared to the state median monthly rent of $330.

3.10.1.4 Public Finance

The ROI for public finance consists of local governmental units that are expected to experience the majority of the effects of the proposed project. These jurisdictions are the counties of Benewah and Shoshone. Financial data were unavailable from Benewah County. For Shoshone County in FY2000, with total revenues of $7,462,525, the principal sources were intergovernmental revenues (42 percent), taxes (33 percent) and miscellaneous (10 percent). The principal categories for expenditures (total $9,158,994) were for roads (28 percent), general government (28 percent) and public safety (23 percent). There was a net deficit of about $1,696,469 or about 23 percent of the total revenues. Property taxes in 2001 were $5,632,703 for Benewah County and $10,550,233 for Shoshone County.

3.10.1.5 ECG Employment and Revenues

Historical economic data for ECG are presented in Table 3.10-2. Full-time employment has ranged from 40 to 47. Additional seasonal employment has ranged from 6 to 18. Salaries have varied from

$1,375,502 in 1999 to $1,818,850 in 1995. Sales (revenues) varied from $4,568,262 in 1999 to $6,789,390 in 1997. Salaries have been approximately a quarter of the revenues.

Table 3.10-2. ECG Employment, Salaries and Sales (1994-2002)

	1994	1995	1996	1997	1998	1999	2000	2001	2002
Employees	58	64	58	58	57	58	57	55	49
Full-Time	40	47	47	44	46	43	48	45	43
Seasonal	18	17	11	14	11	15	9	10	6
Salaries Paid ($)	1,381,781	1,818,850	1,455,077	1,400,737	1,488,669	1,375,502	1,578,796	1,424,077	1,280,403
Sales (Revenues) ($)	5,838,252	5,920,842	5,825,281	6,789,390	6,067,503	4,568,262	6,109,316	6,490,023	4,868,353

Source: ECG 2003

Based on the socioeconomic sector for miscellaneous nonmetallic metals (sector 47) that includes garnet mining (SIC 1499), a total employment multiplier of 1.891 was calculated for the two county ROI using the IMPLAN 2.0 model (Minnesota IMPLAN Group, Inc. 2002). Assuming a baseline employment of an equivalent of 50 full-time employees (seasonal workers being considered to be the equivalent of half-time workers), current ECG Company activity is estimated to generate about 50 secondary jobs in the region (both indirect and induced). Therefore, a total of about 100 jobs are currently generated in the region.

3.10.1.6 Environmental Justice

EO 12898, *Federal Actions to Address Environmental Justice in Minority and Low-Inocme Populations*, directs federal agencies to identify and address, as appropriate, disproportionately high and adverse health and environmental impacts on minority and low-income populations. Similarly, EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks*, addresses protection of children from disproportionate environmental health and safety risks from federal actions.

The environmental justice analysis focuses on the potential for minority populations, low-income populations and children living in the region to be disproportionately affected by implementation of the proposed action and alternatives. Resource impact conclusions were reviewed to identify potential impacts on human populations. If adverse impacts on human populations were identified, the specific impact to minority and low-income persons was then analyzed by comparing impacts on the general population (i.e., in the region of comparison) with impacts to minority and low-income populations to determine if there would be a disproportionate effect. The ROI contains one or more local jurisdictions where most of the project impacts are expected to occur. For this project, the two counties of Benewah and Shoshone are the areas of concern. Data used for the environmental justice analysis were collected from the 2000 Census.

Minority populations are defined as persons of Hispanic origin of any race, Blacks, American Indians, Eskimos, Aleuts, Asians or Pacific Islanders. Low-income populations are defined as persons living below the poverty level.

Table 3.10-3 displays the total population, total minority population, percentage minority, total low-income population, and low-income percentage for these jurisdictions within the region, as well as for the region a whole and for the State of Idaho.

Table 3.10-3. Minority and Low-Income Populations (2000)

Area Name	*Total Population*	*Minority Population*	*Percent Minority*	*Low-Income Population*	*Percent Low-Income*
Benewah County	9,171	873	9.5	1,623	17.7
Shoshone County	13,771	334	2.4	2,882	20.9
ROI	22,942	1,207	5.3	4505	19.6
State of Idaho	1,293,953	73,395	5.6	152,686	11.8

Source: U.S. Bureau of the Census 2002b

In 2000, the ROI population of 22,942 contained approximately 5.3 percent minorities. The percentage of low-income persons was 19.6. This percentage is based on a U.S. Census population estimate that excludes selected groups.

EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks*, requires Federal agencies to ensure that their policies, programs, activities, and standards address potential risks that may disproportionately affect children. The order defines environmental health and safety risks as "risks to health or to safety that are attributable to products of substances that the child is likely to come in contact with or ingest." According to the U.S. Census for 2000, 24.5 percent of the population in the ROI are children under the age of 18, compared to 28.5 in the states of Idaho.

Because the proposed alternatives do not produce a substantial change with regard to the health or environmental impacts on minority, low-income or children in the ROI, this analysis is not discussed further under environmental consequences.

3.10.2 Environmental Consequences

3.10.2.1 Alternative 1 – No-Action

Under the No Action alternative, 133 acres of wetlands would not be mined but mining activities would continue on 77.8 acres of upland area. Based on information provided by the project proponent (ECG), the current garnet mining operations maximize efficiency and cost effectiveness using existing equipment and personnel. The operation could continue at existing levels of production for the near future. However, under the No Action alternative this level of operation would begin a decline within one to two years and would cease production within four to seven years. This would decrease the proposed market longevity of the operation by up to 15 years. With the cessation of garnet mining operations, the 50 direct jobs and approximately 50 indirect and induced jobs associated with mining would no longer exist.

The loss of 100 jobs would represent approximately 0.9 percent of the two-county ROI full and part-time jobs of 10,992 in 1999. Such a reduction represents about 2.1 percent of the employment in Benewah County, which had 4,820 full and part-time jobs in 1999.

Because of the nature of the transition period over the next decade, opportunities exist to allow some of the workers to obtain additional training and/or other jobs, somewhat buffering the gradual loss in jobs. Although detrimental to the individuals directly affected both directly and indirectly, the job loss over the time period is not considered significant.

With an average household size in the ROI of about 2.42, and assuming conservatively that there is one employee per household, the population associated with the employment of 100 persons is about 242 persons. This represents about 1.1 percent of the two-county ROI population of 22,942 in 2000. Although some workers may choose to leave the ROI, it is expected that many would remain in the area. Even in a worst-case scenario of many choosing to leave, the impact on population-related services would be small.

Assuming that each employee has a demand for one housing unit, then 100 housing units are associated with the employees. This represents about 0.89 percent of the two-county ROI housing of 11,295 in 2000. As discussed above, it is expected that even in a worst-case scenario, the impact on housing would be small.

3.10.2.2 Impacts Common to All Alternatives

For all action alternatives, there would be no significant impacts on employment, housing, or population-related services during the extended periods of mining operations. After the mining resources have been exploited, the impacts would be similar to those described for the No Action alternative.

3.10.2.3 Impacts Unique to Specific Alternatives

Alternatives 2 and 3

The selection of Alternative 2 or 3 would essentially provide the same socioeconomic benefits. Both would result in maintaining the approximate level of current operations for an extended period of time. There may be some seasonal variation in the employment, but the average level and seasonal variations in employment would likely be virtually identical to existing conditions. The employment and other economic benefits of the operation would continue in the region for an extended period until mining resources have been exploited.

Alternatives 8, 9, and 10

Alternatives 8, 9, and 10 are alternatives that limit the acreage mined in order to avoid oxbow disturbance. They would result in a reduction in the total number of months of optimal operation: 69, 48, and 22 months, respectively, and a maximum reduction in tonnage mined of about 33.8, 23.3 and 11.5 percent, respectively. After the mining resources have been exploited, the impacts would be similar to those described for the No Action alternative, except that the impacts would begin sooner for Alternatives 8, 9, and 10 than for Alternatives 2 and 3, and therefore would have slightly greater adverse impacts.

3.10.3 Mitigation

No mitigation is required with regard to socioeconomic impacts for the proposed action and other mining activity alternatives. The identified employment under the various alternatives would permit approximately current levels of employment to be maintained over a varying number of years.

3.11 Visual Resources

Visual resources are the natural and human-made features that give a particular environment its aesthetic qualities. These features form the overall impression that a viewer receives of an area or its landscape character. Landforms, water surfaces, vegetation, and manmade features are considered characteristic of an area if they are inherent to the structure and function of the landscape. Such features appear to be indigenous. Landscape character is evaluated to determine whether a proposed a project would appear compatible with an affected setting or would noticeably contrast with it. The ROI for visual resources consists of the proposed mining area and the lands directly adjacent to the mining area. Although the proposed project would be located on private lands, National Forest land within 2 miles of the proposed mining area has visual quality objectives that may be considered in this analysis.

3.11.1 Affected Environment

ECG currently mines five permit areas in Carpenter and Emerald basins and four permit areas near and along the St. Maries River. ECG has been mining these areas for about 10 years. The proposed project area is located between Carpenter Creek and Emerald Creek drainages along the St. Maries River. Other small drainages that intersect the project area include the Adams Creek, Pierce Creek, Hatton Creek, and Olson Creek. St Maries River, running alongside the project area, provides a focal water feature to the area. It is not designated as a Wild and Scenic River.

The landscape character of the proposed project area is a combination of forest and meadow landscapes that have been modified by timber harvesting, grazing, and road construction. Large openings flanked by coniferous and cottonwood trees with expanses of grasses that allow grazing are common at the proposed site. Heavily forested rolling hills provide the backdrop to the proposed site. The viewshed of the existing Emerald Greek Garnet mining operations adjacent to the proposed project area has been modified by mining activities and land reclamation. Mining office building, processing plant (jig plant) trackhoes, and trucks, shape the visual landscape adjacent to the proposed project area. Haul trucks and other vehicles are also transitory fixtures in the landscape.

State Highway 3 bisects the project area. This road provides the most obvious views of the proposed mining areas to the public. Where trees are close to the road, views are kept to the foreground. In meadows and open spaces, the middleground consisting of forested hills is visible. The proposed mining area is surrounded by private and state land. Lands adjacent to the proposed area are not monitored or managed by the USFS or other federal agency.

Idaho Panhandle National Forest lands are located to the east and south, beginning about 2 miles from the project area (refer to Figure 3.7-1). The USFS has identified a Visual Quality Objective (VQO) for the lands they administer in the area. The VQO is Partial Retention, meaning that USFS management activities should remain visually subordinate to the surrounding landscape. The landform, vegetation patterns, water characteristics, and cultural features in the area provide ordinary or common scenic quality. The USFS visual sensitivity level for USFS activities along State Highway 3, Emerald Creek Road, and Emerald Creek Garnet Area, is Medium (USFS 2001a). While this does not apply directly to private actions in the vicinity, it provides an overall sense of visual sensitivity in the area.

3.11.2 Environmental Consequences

3.11.2.1 Alternative 1 – No Action

Under the No Action alternative, mining activities would continue in 77.8 acres of upland. The visual landscape as a result of mining operations would continue as it does today. ECG would continue to reclaim the disturbed land after mining. In four to seven years, the existing permitted garnet deposits are expected to be depleted. Afterwards, the land will be monitored by the USACE to ensure compliance with existing permit requirements.

3.11.2.2 Impacts Common to All Alternatives

Mining activities can affect the visual landscape due to contrasts created between natural appearing landforms and vegetation, and those modified by mining operations. Contrasts are created by human-induced changes in vegetative cover, elevation, and soil disturbances. In the proposed mining areas, activities such as the use of large machinery, trucks, vegetation removal, stockpiling, and soil disturbances would create a contrast with the surrounding environment. The view would temporarily change from a natural-appearing landscape to a mining landscape. However, the proposed project area is adjacent to existing mining activity, so the mining landscape would not be uncommon.

State Highway 3 provides the most sensitive viewpoint, as the general public uses it for recreation and travel. Due to vegetative screening in the foreground, the views of the proposed mining areas from the highway would have a peek-a-boo effect between mining activities and natural-appearing landscape. The changes to the landscape would be temporary, would be limited to 327.5 acres and would not occur all at once. The proposed mining areas would be mined in units. Each unit would be mined completely, then rehabilitated and reclaimed, and mining operations would move on to another mining unit. By limiting the amount of land disturbed at a time, the visual disruption to the landscape would be diminished. ECG would also implement a land reclamation plan to diminish the effects of the proposed mining. Once the land has been mined, the area would be restored to a natural appearing landscape. This would include returning the surface to pre-mining floodplain elevations, revegetating the disturbed soil with endemic seed mixes, and fencing the area to protect it from cattle. Volume II Appendix A proposed reclamation plans in detail. Volume II Appendix L provides summaries and photographs of areas previously reclaimed by ECG.

3.11.2.3 Impacts Unique to Specific Alternatives

The slight potential decrease in land area mined in Alternatives 8, 9, and 10 and would not affect the overall visual impact from mining. More or less truck traffic and activities could occur with the different alternatives. However, again, this would not be a substantial change from the overall impact from mining operations as discussed above.

3.11.3 Mitigation

3.11.3.1 Prior To and During Mining

Most mining operations would occur in the foreground and would be evident from State Highway 3. However, not all 327.5 acres (maximum acreage for all the alternatives) would be mined at once. Up to three units would be mined per year. The smallest acreage affected would be 5.2 acres in the first year and the largest area, 29.8 acres in the sixth year based on the conceptual mining sequence shown in Volume II Appendix A.

3.11.3.2 Post-Mining

The proposed reclamation plan would restore the landscape back to a natural looking state. Wetlands would be replaced in a greater area than currently exists. Riparian stream bank conditions would be improved; a net increase in riparian trees would occur; and snags, down logs, and wildlife corridors would create greater wildlife habitat. Short-term and long-term fencing would be used for reclamation. Short-term perimeter fencing would be placed around each reclaimed mining unit during the first year of reclamation. Long-term cluster fencing around trees would also be used to protect planted trees until they are well established with healthy root systems and crown development.

3.12 Noise/Air Quality

Noise is defined as unwelcome or unwanted sound that emanates from human activity or natural phenomenon within a locale. It is further defined as sound that disrupts normal activities or that diminishes the quality of the environment. Sound levels are usually measured and expressed in decibels (dB). Noise sources are either stationary or transient. Stationary sources are typically related to land uses, such as industrial plants. Transient noise sources occur in an environment either along permanent established paths, such as roads or railroads, or in a random pattern, such as aircraft. Noise is either intermittent or continuous. The total noise impact in a locale is a combination of the background or ambient acoustics and a proposed noise source. The human response to noise is diverse and varies with the type of noise, the time of day, and the sensitivity of the receptor. The ROI for noise would include the proposed mining areas, associated roads used by project haul trucks, and properties adjacent to the project area.

Air quality in a given location is defined by the concentration of various pollutants in the atmosphere, generally expressed in units of parts per million (ppm) or micrograms per cubic meter ($\mu g/m^3$). The significance of a pollutant concentration is determined by comparing it to a national and/or state ambient air quality standard. These standards represent the maximum allowable atmospheric concentrations that may occur and still protect public health and welfare with a reasonable margin of safety. The national standards are established by USEPA and termed the National Ambient Air Quality Standards (NAAQS). The NAAQS include primary standards designed to protect public health and secondary standards designed to protect public welfare from impacts such as damage to property and vegetation. The Air Quality Division (AQD) of the IDEQ has adopted the NAAQS to regulate sources of air pollution within Idaho.

Identifying the ROI for air quality requires knowledge of the types of pollutants being emitted, emission rates of pollutant sources, and meteorological conditions. The ROI for inert pollutants (other than secondary pollutants, such as ozone [O_3] or photochemical particulate matter and their precursors) is generally limited to a few miles downwind from a source. The ROI for secondary pollutants can extend much farther downwind than for inert pollutants. Secondary pollutant formed in the atmosphere by photochemical reactions of previously emitted pollutants, or precursors. O_3 precursors, for example, are mainly volatile organic compounds (VOCs) and nitrogen oxides (NO_x). In the presence of solar radiation, the maximum effect of VOCs and NO_x emissions on O_3 levels usually occurs several hours after they are emitted and many miles from the source. Therefore, the ROI for O_3 may include much of Benewah County.

3.12.1 Affected Environment

3.12.1.1 Noise

The proposed project area occurs within the St. Maries River basin, which is primarily rural in nature. Ambient noise sources in the area mainly include vehicles that traverse U.S. Highway 3, Emerald Creek Road, and Carpenter Creek Road. Other sources occur from the St. Maries River railroad and sources associated with relatively low levels of grazing, mining, and forestry activities. The intermittent nature of these sources produces relatively low background noise levels in the project area. Because the project area is predominantly located in isolated open fields and wooded areas along the St. Maries River, it would experience ambient noise levels below 40 dB. Figure 3.12-1 provides examples of outdoor Day-Night Average Sound Levels (L_{dn}).

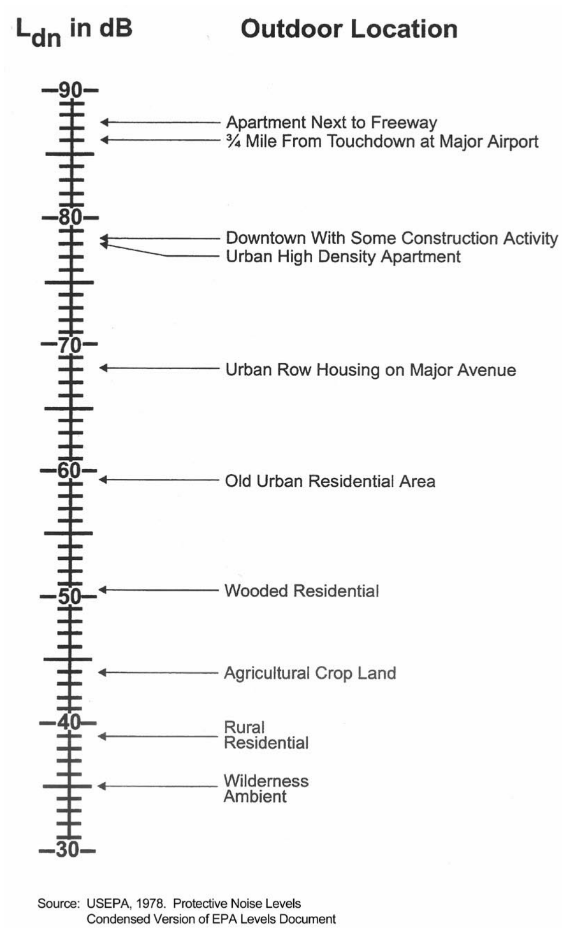


Figure 3.12-1. Examples of Outdoor Day-Night Average Sound Levels in dB

Receptors in the project area include scattered residential dwellings and people involved in recreational activities, such as hunting, gemstone mining, fishing, camping, and sightseeing. The nearest population center is the unincorporated town of Fernwood, about 3 miles south of the project site.

3.12.1.2 Air Quality

USEPA designates all areas of the U.S. as having air quality better than (attainment) or worse than (nonattainment) the NAAQS. A nonattainment designation generally means that a primary NAAQS has been exceeded more than once a year in a given area. Due to the rural nature of the project region and a lack of substantial emission sources, Benewah County is in attainment of all NAAQS. The nearest nonattainment area to the project site is the Pinehurst particulate matter less than 10 microns in diameter (PM_{10}) nonattainment area, about 45 miles north-northeast of the project area.

3.12.2 Environmental Consequences

3.12.2.1 Noise

Alternative 1 – No Action

Under the No Action alternative, mining activities would continue on 77.8 acres of upland. Noise impacts associated with the existing ECG mining operations would decrease within the next one to two, due to a gradual decrease in operations. As a result, implementation of the No Action alternative would represent a net noise benefit to the project region.

Impacts Common to all Alternatives

Noise impacts from the proposed mining and reclamation activities would occur mainly from mobile and portable mining equipment and haul trucks that operate within the proposed mining areas and adjacent road systems. These sources would be intermittent and would operate mainly during daylight hours. Given that there are few receptors in proximity to the project site, noise impacts from any project alternative would not be significant. Alternative 3 would produce the highest noise impacts of any project alternative, as it would require the greatest amount of equipment usage.

Impacts Unique to Specific Alternatives

There are no unique noise impacts that would be specific to any project alternative.

3.12.2.2 Air Quality

Alternative 1 – No Action

Under the No Action alternative, mining activities would continue on 77.8 acres of currently permitted area. Air quality impacts associated with the existing ECG mining operations would decrease within the next one to two years, due to the gradual decrease in these operations. As a result, implementation of the No Action alternative would represent a net air quality benefit to the project region.

Impacts Common to all Alternatives

Air emissions from the proposed mining and reclamation activities would mainly occur from diesel-powered mobile and portable mining equipment and haul trucks that operate within the proposed mining areas and adjacent road systems. Fugitive dust in the form of PM_{10} would also occur from earth-moving activities associated with mining and reclamation, wind blowing over exposed soil surfaces, and haul trucks that would operate on paved and unpaved roads. Fugitive dust from earth-moving activities on dry ground would occur at a rate of about 0.5 tons of PM_{10} per acre-month. The proposed reclamation and re-vegetation program, however, would minimize fugitive dust emissions from any project alternative. It is expected that air quality impacts from proposed sources would be less than significant, as the mobile and/or intermittent nature of these sources would produce minimal impacts in a localized area. Alternative 3 would produce the highest air quality impacts of any project alternative, as it would require the greatest amount of equipment usage.

The AQD of the IDEQ implements the Clean Air Act (CAA) in Idaho to ensure that sources do not cause violations of the NAAQS. Since project sources are principally mobile in nature, they would not require air permits from the AQD.

Impacts Unique to Specific Alternatives

There are no unique air quality impacts that would be specific to any project alternative.

3.12.3 Mitigation

3.12.3.1 Noise

Since noise impacts would be less than significant from all project alternatives, these impacts would not require mitigation.

3.12.3.2 Air Quality

Since air quality impacts would be less than significant from all project alternatives, these impacts would not require mitigation.

3.13 Hazardous Materials

The attributes of hazardous materials considered include the types and amounts of hazardous materials used and kept on site, and the regulatory requirements ECG must follow in order to remain in compliance. The ROI for hazardous materials includes the 327.5 acres of the proposed project, and those areas affected by the direct, indirect, secondary, and induced activities of the proposed project; that is, whereever hazardous materials may be used, and all areas that could be affected by accidental spillage.

3.13.1 Affected Environment

Hazardous materials such as fuels, oils, and lubricants are supplied on an as-needed basis to ECG by Chevron. No hazardous materials are kept on the active mine sites, although several hazardous materials are stored on other property, specifically the maintenance shop owned by ECG. All hazardous material required to operate equipment on an active mining site are trucked by Occupational Safety and Health Administration (OSHA) or Department of Transportation (DOT) hazardous material certified employees. Hazardous materials used for mining activities are stored in the maintenance shop on property owned by ECG located at some distance from the active mine site. There have been no IDEQ departmental hazardous material clean-up activities at any active ECG mine sites (personal communication, Beck 2002). Equipment refueling and lubrication done within the active mine site are done by OSHA hazardous material certified ECG employees (personal communication, Osburn 2002). ECG is currently in compliance for the delivery, handling, storage, and disposal of hazardous products and materials used in mining operations. In the event of a vehicle accident resulting in spilled hazardous material, absorbents would be applied, contaminated soil excavated and treated according to DEQ standards (personal communication, Osburn 2002), and the incident would be reported to the Coeur d'Alene Regional DEQ Office (personal communication, Harmon 2002).

A Phase I Site Assessment of the proposed mining area was performed in conformance with the scope limitations of ASTM Practice E 1527-97 to identify to the extent feasible any "recognized environmental conditions" (Leppo Consultants, Inc. 1999). "Recognized environmental condition" as defined by ASTM standard means the presence or likely presence of any hazardous substances or petroleum products on a property under conditions that indicate an existing release, a past release, or material threat of a release of any hazardous substance or petroleum products on the property or into the ground, groundwater, or surface water of the property. The site assessment revealed no evidence of "recognized environmental conditions" in the project area (Leppo Consultants, Inc. 1999).

Table 3.13-1 lists hazardous materials used on the site and an estimate of quantities stored at ECG's maintenance shop.

All equipment utilized in the extraction, processing, and hauling of the garnet ore is serviced according to an ECG scheduled maintenance plan. The plan assures that each piece of equipment is serviced regularly and checked for items needing repair. Daily service includes fueling, greasing, lubricant checks, and filter checks. Scheduled service includes oil change, fuel and oil filter change, hydraulic fluid and filter change, air filter change, and cooling system flush with coolant replacement. Daily service is completed by the equipment operators and service trucks; while the scheduled service is completed by maintenance personnel on-site or in the service shop. Absorbent materials are provided on-site and with the service vehicles to provide immediate spill containment and collection. Used petroleum products and filters are transported to the service shop after on-site maintenance for storage. All petroleum products are stored at the service shop until they are recycled (ECG 2000).

Table 3.13-1. On-Site Hazardous Materials: Quantities Stored and Used

Product	*Container Size*	*Quantity Stored*	*Quantity Used*
Acetylene	120 cubic inches	18 bottles	4 bottles per month
Antifreeze	55 gallon drum	2 drums	1 drum per month
Battery Acid		2 gallons	1 gallon per year
Blue Shield	300 inch (3) bottles	8 bottles	2-4 bottles per month
DOT 3 Brake Fluid	gallon	5 gallons	3 gallons per year
Brakleen Aerosol	1 pound 3 ounce can	10-15 cans	100 cans per year
Clean R Carb	11 ounce can	10-15 cans	12 cans per year
Non-tax Diesel	Bulk Tank	3,000 gallons	12,124 gallons per month
Taxable Diesel	Bulk Tank	3,000 gallons	1,616.5 gallons per month
Unleaded Gas	Bulk Tank	1,200 gallons	2,424.5 gallons per month
Nuto 68/Hydraulic Fluid	55 gallon drum	300 gallons	100 gallons per month
10 Weight Oil	55 gallon drum	300 gallons	50 gallons per month
30 Weight Oil	55 gallon drum	300 gallons	50 gallons per month
Oxygen	244 cubic inches	20 bottles	6-8 bottles per month
Silicone	10.1 ounce tubes	12 tubes	48 tubes per year
SOK/Penetrating Oil	10 ounce can	10-15 cans	60 cans per year
Starting Fluid	10.7 ounce cans	20 cans	60 cans per year
Super Flo ATF	55 gallon drum		25 gallons per month
Welding Rod		200 pounds	200 pounds per month
XD-30	55 gallon drum		25 gallons per month
Solvent	30 gallon tank	0	0

Source: ECG 2002

3.13.2 Environmental Consequences

3.13.2.1 Alternative 1 – No Action

Impacts relating to hazardous materials are not expected under the No Action alternative. Hazardous materials used by ECG for mining activities are stored in the maintenance shop on property owned by ECG located at some distance from the active mine site. Equipment refueling and lubrication done within the active mine site are done by OSHA hazardous material certified ECG employees (personal communication, Osburn 2002). ECG is currently in compliance for the delivery, handling, storage, and disposal of hazardous products and materials used in mining operations. Hazardous materials clean up procedures, in the event of an accident, are a part of the OSHA training.

3.13.2.2 Impacts Common to All Alternatives

Impacts relating to hazardous materials are not expected under any of the alternatives. During implementation of any of the alternatives, ECG would continue to follow established practices and regulatory compliance and reporting requirements for hazardous substance storage, use, and disposal. Hazardous materials used by ECG for mining activities would be stored in the maintenance shop on property owned by ECG located at some distance from the active mine site. Equipment refueling and lubrication done within the active mine site would be done by OSHA hazardous material certified ECG employees (personal communication, Osburn 2002). Hazardous materials clean up procedures, in the event of an accident, are a part of the OSHA training. Mitigation measures would prevent environmental consequences as a result of hazardous materials transport and storage in the ROI.

3.13.2.3 Impacts Unique to Specific Alternatives

There are no hazardous materials impacts unique to specific alternatives. Materials handling procedures would be the same for all alternatives as described in section 3.13.2.2.

3.13.3 Mitigation

In the event of accidental spillage of fuel, oils, or lubricants, OSHA hazardous material-certified ECG employees would apply sorbant pads to the spill area to absorb the hazardous material. Contaminated sorbant pads materials would be disposed of off-site in appropriate disposal facilities. Contaminated soil would be treated according to the DEQ's Procedures for Land Treatment of Petroleum Contaminated Soils (IDEQ 1997). To date there have been no accidental spills on any active or formerly active mining sites (personal communication, Osburn 2002). Contaminated soil was found near old, buried storage tanks and was voluntarily cleaned up in 1996. All hazardous materials are stored at some distance from active mining sites on ECG owned property. Equipment refueling and lubrication done within active mine sites are handled by OSHA hazardous material certified ECG employees. Any hazardous material spillage clean-up would follow OSHA certified procedure. Therefore, no mitigation plan is required at this time under any alternative. A hazardous material management and health and safety plan should be developed for this site.

3.14 Cumulative Impacts

3.14.1 Introduction

The Council on Environmental Quality (CEQ) defines a cumulative impact as follows:

> *"The impact on the environment which results from the incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor, but collectively significant, actions taking place over a period of time."* (40 Code of Federal Regulations [CFR] section 1508.7).

Cumulative environmental impacts are most likely to arise when a relationship exists between proposed alternatives and other actions expected to occur in the ROI for the resources analyzed and also in a similar time periods. Projects in close proximity to the proposed alternatives would be expected to have a greater potential for a relationship that would result in potential cumulative impacts than those more geographically separated. Such projects could be proposed by various agencies (federal, state, or local) or persons.

The selection of actions to include in the cumulative effects analysis depends on whether they affect the human environment. Although there is no universally accepted framework for cumulative effects analysis, general principals guided the analysis.

1) Cumulative effects are analyzed in terms of the specific resource, ecosystem, and human community being affected.

2) It is not practical to analyze the cumulative effects of an action on the universe; the list of environmental effects must focus on those that are meaningful.

3) Cumulative effects on a given resource, ecosystem, and human community are rarely aligned with political or administrative boundaries.

4) Cumulative effects may result from the accumulation of similar effects or the synergistic interactions of different effects.

This cumulative effects analysis was conducted by: establishing the geographic scope for the analysis or ROI; establishing the time frame for the analysis; identifying other actions affecting the resources, ecosystems, or human communities of concern; defining a baseline condition for the resources, ecosystems, and human communities; and identifying potential cumulative effects.

3.14.2 Cumulative ROI

The St. Maries River watershed, a 485 square mile watershed comprising approximately 25 percent of the 1,860-square-mile St. Joe sub-basin, was defined as the ROI for cumulative impacts for most resources, including water resources, biological resources, and wetlands. Incremental loss of wetlands is the principal cumulative effects situation requiring analysis in this DEIS. For socioeconomics, Benewah and Shoshone counties were defined as the ROI, while the Benewah County Airshed was defined as the ROI for air quality.

3.14.3 Past and Present Actions

The potential environmental effects of past actions, as well as the effects of the relevant past and on-going activities were considered in the analysis of the proposed alternatives and associated baseline conditions. This discussion follows the groundwork laid in the Affected Environment and Environmental Consequences resource sections, which provide background on how past and present forces have cumulatively contributed to the current status of each resource.

The St. Maries riparian system is a product of historic and on-going anthropogenic processes including fires, fire suppression, clearing, grazing and other agricultural activities, logging, and mining. Most of these processes are long-standing and influential. For example, aerial photographs from 1955 indicate that range and farming improvement practices converted large portions of the floodplain from native vegetation to seeded fields. Though hay production in the floodplain was common 40 years ago, today the area is used primarily for cattle grazing. Open range laws have encouraged cattle grazing of riparian corridors. Cattle grazing during the summer and fall months has occurred annually for more than 50 years. There are portions of four USFS grazing allotments in the St. Maries River Basin. Cat Spur Creek Allotment, Keeler Creek Allotment, Emerald Creek Allotment, and Merry Creek Allotment. All four allotments are in the process of updating their allotment management plans (USFS 2001b). No change in animals or animal months is anticipated in the update of the allotment management plans, however, there is increased monitoring for vegetation, soils, and fish habitat proposed.

Extensive logging occurred between 1880 and 1935, including salvage logging after the 1910 fires. Salvage logging activities included building railways through the floodplain and building splash dams to float large volumes of logs downstream. In the St. Maries River Basin, continued timber harvest and the associated road maintenance, construction, and reconstruction on USFS as well as corporate lands (i.e., Potlatch Corporation and Crown Pacific) can be expected.

Commercial mining for garnet has occurred in much of the Emerald Creek drainage on both public and private lands. Two lease renewals, one new lease application, one prospecting permit extension, and eight new prospecting permit applications have been submitted (USFS 2001a). The USFS currently manages a public digging area (by fee permit) in 281 Gulch, a tributary to Emerald Creek. In 1994 the USACE issued a 404 permit to ECG to dredge mine 257 acres of jurisdictional wetlands in the Emerald Creek and Carpenter Creek basins. This permit will expire in 2004. In addition, 297 acres of upland habitat has already been authorized for dredge mining by the IDL in these same basins.

USACE 404 Permit Actions

As of 2002, 11 Section 404 permits had been issued in the St. Maries River watershed above the confluence with the St. Joe at St. Maries:

- 1 permit for garnet mining to Emerald Creek Garnet. 257 acres of temporary wetland fill with restoration required.
- 2 permits for temporary road crossing during bridge replacement activities.
- 1 permit for recreational garnet digging to the USFS for a very small temporary sedimentation structure (berm) in intermittent stream channel during summer no-flow season. Removal and restoration was required at year's end.
- 1 permit for wetland discharge during exploratory drilling activities for garnet. Restoration required.
- 1 permit for bridge repair-riprap around repaired abutments. Minimal impact.
- 1 permit for discharge during bridge replacement. Minimal impact.
- 3 permits for discharges for fish and wildlife enhancement projects. All were stream channel enhancements.
- 1 permit for culvert replacement.

The combined effects from these, and other disturbances such as roads, are considered in the cumulative impact evaluations and discussions included in section 3.14.5.

3.14.4 Reasonably Foreseeable Future Actions

The following foreseeable future projects were considered for their potential to result in cumulative impacts. In each case, the assessment focuses on addressing two fundamental questions: 1) Does a relationship exist such that the impacts for the proposed alternatives might affect or be affected by the impacts of these other actions? and 2) if such a relationship exists, does this assessment reveal any new information not identified when the proposed alternatives are considered alone? Reasonably foreseeable future actions within the next one to 10 years include projects such as mining, timber harvest, and road maintenance and construction. Discussion of these projects including identification of the proposing entity, is provided below.

U.S. Forest Service

In the St. Maries River Basin, continued timber harvest and associated road maintenance, construction, and reconstruction on Forest System land is reasonably foreseeable. Specifically within the ROI, the USFS has two proposals currently undergoing analysis pursuant to NEPA. The *Garnet Stars and Sands Draft Environmental Impact Statement* (USFS 2001a) analyzes the effects of expanding the recreational garnet digging area and allowing testing for leasable garnets in several drainages in the St. Maries River Basin. Mitigation and design criteria have been developed to minimize environmental disturbance. The project includes: public recreational gemstone digging (Wood Creek and tributaries of the East Fork of Emerald Creek, including 281 Gulch, Garnet Gulch, No name, PeeWee and Strom Creeks); lease application (lease application for gemstones on Bechtel Butte would be approved); prospecting permits; lease renewal; conditions and reclamation; and forest plan amendment and other agency permits.

The *Hidden Cedar Draft Environmental Impact Statement* (USFS 2001b) is designed to improve watershed conditions and move designated landscape assessment areas towards the desired condition as defined by the Idaho Panhandle Forest Plan goals and objectives. The EIS includes the evaluation of timber harvest and fuels treatment; white pine restoration; access requests from adjacent landowners and jurisdictions; precommercial thinning, a fish pond; and watershed restoration. The project area includes approximately 37,000 acres of federal and non-federal lands. It includes the Cedar, Blair, Christmas, and Staples creek drainages in the Upper St. Maries River watershed, and the Bechtel, Mazie, Wood, Hidden, Cat Spur, Lower Slim, and Keeler Creek drainages in the West Fork of the St. Maries River watershed.

In addition to timber harvest and watershed improvements, there are portions of four grazing allotments in the St. Maries River Basin that are in the process of updating their allotment management plans (USFS 2001b). No change in animals or animal months is anticipated in the update of the allotment management plans, however, there is increased monitoring for vegetation, soils, and fish habitat proposed

On Forest Service roads, routine road maintenance is likely to occur as needed on existing roads in the St. Maries Basin. The roads most likely to receive maintenance are those open to vehicle traffic. There would also be continued road maintenance on roads contained within state and private lands (see Table 3.14-1).

Table 3.14-1. Future Road Construction and Maintenance Projects

Road	*Distance*	*Owner*
Staples Creek Spur Road	0.78 mile	Potlatch Corporation
Cats Spur Creek Road (Sections 29 & 20)	0.41 mile	Potlatch Corporation/ IDL
Cats Spur Creek Road (Sections 29 & 30)	0.62 mile	Potlatch Corporation
Keeler Creek Roads	0.20 mile 1.20 miles 0.80 mile 0.50 mile 1.40 miles 0.70 mile	Potlatch Corporation/ IDL/USFS

Idaho Department of Lands

IDL's "Proposed Timber Sale Plan" for July 2001 through June 2002 includes four timber sales and associated road activities within the St. Maries River Basin (State of Idaho 2001). The proposed sales include:

- *Graham Springs*. This sale is located on Graham Mountain, approximately 8 miles northeast of Kingston, Idaho. The silvicultural prescription would be for shelterwood cutting in this mature stand. Both tractor and skyline skidding would be required. Developments would include installation of a railroad car bridge, pit run surfacing of 1.6 miles of secondary road, 8.0 miles of secondary road reconstruction, and 1.0 mile of secondary road construction. There are several Class II streams within the sale area.

- *North Lindstrom*. This sale is located 5 air miles south of St. Maries, Idaho, in the St. Maries River drainage. Several unnamed Class II streams originate within the sale. This sale is marked with a shelterwood silvicultural prescription. Both ground based and skyline harvest methods would be utilized. Developments would include reconstruction and rocking of approximately 2.5 miles of existing secondary road and construction of approximately 4.0 miles of secondary road.

- *Confusion Creek*. This sale is located in the Olson Creek drainage, approximately 5.5 air miles east of Fernwood, Idaho. This sale would be a shelterwood harvest. Both tractor and skyline skidding would be used, including the utilization of forwarding. Developments include approximately 1.0 mile of secondary road reconstruction and approximately 5.0 miles of secondary road open and improve. Portions of Confusion Creek (Class I) are located within the sale boundary. Olson Creek (Class I) is located within a 0.25 mile of the sale.

- *Circus Pole*. This sale consists of four parcels in Tyson Creek, located to the west and south of the town of Santa, Idaho. Approximately 400 acres would be skyline skidded and 440 acres tractor skidded. Removal of poles 35 feet and longer would be mandatory.

Developments would include approximately 0.60 mile of secondary road abandonment. There are Class II streams present on the sale area.

Private

In the St. Maries River Basin, continued timber harvest and the associated road maintenance, construction, and reconstruction on corporate lands that are currently owned by Potlatch Corporation and Crown Pacific are reasonably foreseeable. Mining by private companies and individuals would also continue to occur within the St. Maries River Basin. Specifically, adjacent to the ECG project site, a parcel of privately-held land may be separately permitted and mined (i.e., separately from ECG's proposed mining).

3.14.5 Cumulative Effects by Resource

3.14.5.1 Water Resources

The St. Maries River watershed was used to assess cumulative impacts to water resources within the project area and vicinity. The combined effects from past and current activities have all contributed to the current impairment and Clean Water Action §303(d) listing of the St. Maries River. Within the ROI, the St. Maries River watershed is listed for sediment, temperature, habitat alteration, nutrients, pathogens, and dissolved oxygen. The St. Maries River itself is listed for sediment and temperature (between Clarkia and Mashburn). Historical timber harvesting, placer mining, and grazing of streamside pastures have affected nearly all of the tributaries and floodplains of the St. Maries River watershed since they were instigated in the early 1900s (IDEQ 2003).

Although the proposed mining alternatives may result in limited and isolated impacts to the water resources contained within the ROI, they are not expected to contribute to the overall cumulative impact of water resources as a whole. This is principally due to the BMPs that ECG will construct to contain surface water runoff and process waters; thereby eliminating sediment transport pathways. Restoration work already completed by ECG on Emerald and Carpenter Creeks is positively contributing to the reduction of sediment in the watershed as a whole. In time, when the restoration of the proposed project is complete, an improvement over the baseline condition (current timber harvest and grazing impacts) should be realized as wetland, floodplain, and riparian corridor functions are restored.

3.14.5.2 Wetlands

The St. Maries River watershed was used to evaluate cumulative impacts to wetlands and other waters. The combined effects from past and current activities described in section 3.14.3, and other disturbances such as roads, have all contributed to the current impairment of the St. Maries River. The designated uses for the St. Maries River from Clarkia to Carpenter Creek are cold water biota, primary contact recreation, domestic water supply, and special resource water. Carpenter Creek is water quality limited due to habitat alteration and sediment. Emerald Creek is also listed for habitat alteration, sediment, and temperature. Perhaps the most substantial limiting factor for the St. Maries watershed is water temperature. Data from aquatic habitat inventories in the St. Maries watershed area suggest the prolonged absence of forested stands in riparian areas has impaired the protection of stream temperatures due to reduced streamside canopies (USFS 2001a). Other water quality parameters such as dissolved oxygen, nutrients, and dissolved metals have not been identified as water quality limiting for the designated uses.

Although the proposed mining alternatives would directly impact wetlands, due to wetland reclamation activities proposed by ECG, these impacts are not considered to contribute to the overall cumulative impact to the wetland resource. It is expected that within 20 years, all of the impacted wetlands would have been reclaimed and that wetland function would be restored in the emergent and scrub-shrub wetland types. Full wetland function in the forested wetland types would take a longer period of time depending on the age of trees impacted.

3.14.5.3 Vegetation

Proposed mining alternatives, along with USACE- and IDL-permitted mining in the ROI would result in upland vegetation removal and loss. Under these permitted actions, ECG is required to restore, re-vegetate, and reclaim mined areas. Because of past and ongoing ECG reclamation, no cumulative vegetation loss is expected. This would represent a continuation of ECG's successful re-vegetation and reclamation efforts to date in Emerald and Carpenter Creek basins.

3.14.5.4 Wildlife

Past, current, and projected mining activity along the St. Maries River, Emerald Creek, and Carpenter Creek amount to a cumulative impact to riparian habitat in the lower portion of the St. Maries watershed. This affects all species groups, especially riparian-nesting songbirds, amphibians and reptiles, aquatic and riparian dwelling mammals, and carnivores and other mammals that may utilize these areas as movement corridors. Mining, combined with existing impacts from the adjacent railroad and highway, results in an increased cumulative disruption of wildlife mobility along the lower St. Maries River.

Special Status Wildlife Species

Proposed garnet mining along the lower St. Maries watershed amounts to a temporary cumulative increase in barriers to wildlife movement to special status carnivores described above. Northern goshawk and northern pygmy owl would realize a temporary decrease in prey base, and northern alligator lizard would temporarily have less overall habitat in the vicinity of the lower St. Maries River.

3.14.5.5 Fisheries

Riparian areas along the St. Maries River have been impacted by adjacent land uses such as timber harvest, splash dam construction, railroads crossing the river and floodplain, roads, livestock grazing, and mining. The combined effects of these disturbances have contributed to large riparian areas being dominated by grasses and shrubs, which has increased sediment production, channel instability, and nutrient loading (USFS 2001a). Data from aquatic habitat inventories in the St. Maries watershed area suggest the prolonged absence of forested stands in these areas has impaired the protection of stream temperatures due to reduced streamside canopies (USFS 2001a). The designated uses for the St. Maries River from Clarkia to Carpenter Creek are cold water biota, primary contact recreation, domestic water supply, and special resources water. The most substantial limiting factor for the St. Maries watershed is water temperature.

Aquatic habitat in the St. Maries River area is unsuitable for salmonid spawning. There is limited potential for viable habitat for special status species, specifically bull trout and cutthroat trout over-wintering and refuge during high flows. Therefore, mining activities that would occur with any of the project alternatives would not result in cumulative impacts to fisheries in the St. Maries River (i.e., no substantial change above baseline condition).

3.14.5.6 Earth Resources

Earth movement from excavation activities as part of the proposed alternatives would have only minor short-term effects to soil and topography. Combined with soil erosion and sedimentation generated from roads and other activities (grazing, mining, and timber harvest), temporary effects to water quality and aquatic habitat may result. It is assumed that other pending projects such as timber harvesting and road construction would implement BMPs to control impacts from earth disturbance and movement. As part of the proposed alternatives, BMPs are incorporated by design as protection and mitigation. Therefore, it is reasonable to assume that with the successful application of BMPs, no cumulative impacts are expected.

3.14.5.7 Land Use and Ownership

Temporary alteration of uses such as grazing during mining, reclamation, and restoration would occur. This sequence of activities would be similar for the proposed alternatives and other reasonably foreseeable projects. No net cumulative change to land uses within the ROI is anticipated.

3.14.5.8 Traffic, Transportation, and Access

The impact to Highway 3 from the proposed Emerald Creek Garnet mining project is minor. Therefore, other projects occurring within the ROI would not produce a cumulative impact. However, an increase in large trucks on the road coupled with seasonal influxes of recreationists may decrease traffic safety along Highway 3. No cumulative impact to transportation resources would occur.

3.14.5.9 Cultural Resources

No cultural resources have been identified in the project area. No cumulative impacts to cultural resources are expected.

3.14.5.10 Socioeconomics

Combined with other projects in the two county socioeconomic region of influence (Benewah and Shoshone) during the next 5 to 10 years, the proposed project may result in a net increase in employment during the life of these alternatives. The other projects under consideration may also partially compensate for the negative socioeconomic impacts of the No Action alternative and when the action alternatives have ceased.

3.14.5.11 Visual Resources

While timber harvesting and road construction occurring in other locations within the ROI may result in visual impact to the immediate landscape, the projects described in sections 3.14.3 and 3.14.4 do not occur in the project viewshed and the associated activities are not visible from the proposed mining areas. Therefore there would be no perceptible cumulative change to the visual landscape.

3.14.5.12 Noise/Air Quality

Noise

Noise from the proposed alternatives or other projects described in sections 3.14.3 and 3.14.4 is expected to occur primarily from mobile and portable equipment operations. Due to the rural and remote nature of the project area and environs; distance of future project sites to one another; and the unlikely possibility of the projects occurring simultaneously at any given point in time, noise would be a localized impact and is not expected to result in any noise related cumulative impacts.

Air Quality

Any future projects that result in earth disturbing activities (e.g., mining, road construction, timber harvesting) may result in fugitive dust; however, due to the generally short-term duration of the activities and rural nature of the region combined with the lack of substantial existing emissions sources and because Benewah County is in attainment for all criteria pollutants; no cumulative impacts are anticipated.

3.14.5.13 Hazardous

No cumulative impacts related to hazardous materials are expected.

3.15 Applicant Proposed Mitigation Measures

Table 3.15-1 identifies applicant-proposed mitigation acreages and vegetation types for the action alternatives for both ECG and other privately-owned land.

3.16 Irreversible or Irretrievable Commitment of Resources

CEQ regulations (Section 1502.16) specify that environmental analysis must address "…any irreversible and irretrievable commitment of resources which would be involved in the proposed action should it be implemented." While the regulations are not specific about the meaning of these terms, it is understood that thorough environmental analysis identifies all resource commitments in order to reveal any potential impacts. Irreversible effects primarily result from permanent use of a nonrenewable resource (e.g., minerals or energy). Irretrievable resource commitments involve the loss in value of an affected resource that cannot be restored as a result of the action (e.g., disturbance of a cultural site) or consumption of renewable resources that are not permanently lost (e.g., old growth forests).

The proposed action would result in an irreversible and irretrievable commitment of some resources since all alternatives involve mining and disturbance of wetland areas. Other impacts are short-term, temporary, or may be reduced through appropriate mitigation measures including reclamation activities. Those resources that may have a possible irreversible or irretrievable commitment are discussed below.

Alluvial garnet is found in concentrations sufficient for commercial mining in Emerald and Carpenter basins, and along the St Maries River below the confluence with Emerald Creek. Almandine garnet found in Emerald, Carpenter, and St. Maries River basins is unique in the world in that it has not been subjected to post-formation stresses, yielding a non-fractured monocrystalline structure. Its durability is based on its competence and its inherent hardness, third only to diamond and Corundom. Once mined, the garnet in the project area is consumed and used and is not replaceable. Therefore, extraction and use of the garnet is an irreversible resource commitment.

Loss of existing wetlands and oxbows constitutes an irretrievable commitment of an established resource. However, reclamation and restoration, as well as constructing new oxbows would create new wetlands and habitats of equal or greater functional value. Therefore there would be no net loss of wetland resources. Vegetation removal, including existing mature trees, on the site also constitutes an irretrievable commitment of resources. However, the proposed reclamation plans would allow for fully functional mature wetlands, including trees, within 15 years.

All alternatives would require fuel and oil lubricant use by vehicles supporting the mining activities. Maintenance of mining equipment would require the consumption of limited quantities of maintenance products. These elements are not uncommon nor would they be used in large quantities.

Table 3.15-1. Reclamation/Mitigation Action Alternatives

Emerald Creek Garnet Ownership (105.7 acres)															
Action Alternatives	Wetlands										Upland				
	Acres			Ratio	Number Oxbows Mined[2]	Oxbow Wetlands Mined (acres)	Vegetation Type After Reclamation (acres)[1]				Total area mined (acres)	Vegetation Type After Reclamation (acres)			
	Wetlands Mined	ECG Wetlands Mined	ECG Wetlands Reclaimed/ Created				EM	SS	FO	OW		Dry Meadow	Shrub	Conifer Tree	Deciduous Tree
Alternative 2	133.0	34.0	59.5	1.7:1	0.5	1.7	34.0	8.8	16.7	0.0	46.2	35.0	0.0	11.2	0.0
Alternative 3	133.0	34.0	59.5	1.7:1	0.5	1.7	34.0	8.8	16.7	0.0	46.2	35.0	0.0	11.2	0.0
Alternative 8	84.3	34.0	56.6	1.7:1	0.0	0.0	33.6	6.3	16.7	0.0	45.1	28.2	0.0	16.9	0.0
Alternative 9	96.9	33.6	59.5	1.7:1	0.5	1.7	34.0	8.8	16.7	0.0	46.2	29.3	0.0	16.9	0.0
Alternative 10	108.9	34.0	59.5	1.7:1	0.5	1.7	34.0	8.8	16.7	0.0	46.2	35.0	0.0	11.2	0.0

Other Private Ownership (221.8 acres)															
Action Alternatives	Wetlands										Upland				
	Acres			Ratio	Number Oxbows Mined[2]	Oxbow Wetlands Mined (acres)	Vegetation Type After Reclamation (acres)[1]				Total area mined (acres)	Vegetation Type After Reclamation (acres)			
	Wetlands Mined	Private Wetlands Mined	Private Acres Reclaimed/ Created				EM	SS	FO	OW		Dry Meadow	Shrub	ConiferTree	Deciduous Tree
Alternative 2	133.0	102.9	102.9	1:1	4.5	34.9	61.7	32.5	8.2	0.5	118.9	113.2	0.0	5.7	0.0
Alternative 3	133.0	102.9	102.9	1:1	4.5	34.9	61.7	32.5	8.2	0.5	118.9	113.2	0.0	5.7	0.0
Alternative 8	84.3	58.0	58.0	1:1	0.0	0.0	36.5	15.9	5.6	0.0	75.9	75.9	0.0	0.0	0.0
Alternative 9	96.6	61.8	61.8	1:1	1.5	7.9	31.1	22.5	8.2	0.0	96.6	96.6	0.0	0.0	0.0
Alternative 10	108.9	82.7	82.7	1:1	2.5	14.2	46.8	28.2	7.7	0.2	93.4	87.7	0.0	5.7	0.0

Notes: 1. EM = emergent; SS = Scrub Shrub; FO = Forested; OW = open water

2. Oxbows would be constructed before they are mined. The pre-mining landscape has 50% of one oxbow on ECG ownership. The post-mining landscape would have three oxbows on ECG ownership.

Should the No Action alternative be selected, an irretrievable commitment of social and economic resources may occur. Under the No Action alternative, the level of mining activity would begin a decline within one to two years, and ECG would cease mining and production of garnet products within four to seven years. This would decrease the proposed market longevity of ECG's mining operation by up to 15 years. With the cessation of garnet mining operations, the 50 direct jobs and approximately 59 indirect and induced jobs associated with the activities would no longer exist. Such a reduction represents about 2.3 percent of the employment in Benewah County.

3.17 Short-Term Uses and Long-Term Productivity

CEQ regulations (Section 1502.16) specify that environmental analysis must address "…the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity." This section evaluates the short-term benefits of the proposed alternatives compared to the long-term productivity derived from not pursuing the environmental resource. Short-term uses of the property under each alternative are described in Chapter 2. Short-term and long-term impacts are presented in sections 3.1 through 3.13 for each resource category. The broad relationships of resource commitments are discussed below.

The short-term use of the property under all alternatives involves mining activities that would disturb vegetation, wildlife habitat and wetlands. Under the action alternatives, activities include land clearing, temporary and haul road construction, and mining. However, within each mining unit mining activities would occur in one year and reclamation activities (including regrading, placing stockpiled topsoil , replanting) would occur over a one to two year period following mining. Therefore the project area would not be subject to mining all at once, but progressively and in sequence over a 10 to 20 year period so that the disturbance would be limited to approximately 20 to 25 acres per year out of a total of 327.5 minable acres. Likewise reclamation to restore the land to pre-mining conditions would occur progressively on an annual basis. The land, including uplands and impacted wetlands, would be restored with the same hydrologic and habitat conditions and wetlands of the same size and in the same geographic location as the pre-mined state.

The long-term productivity of the land would ultimately be the same regardless of the implementation of the action alternatives or the no action alternative. The project area is currently used for grazing and other limited agricultural activities. This use of the property contributes to the aesthetic qualities of the area, but otherwise provides a limited public benefit. The short-term use over an approximately 20 year period for mining activities would remove the valuable minerals from the land and cause the short-term disruption of the project area discussed above. With the successful completion of mining reclamation, however, the land would be restored to pre-mining use of agricultural activities.

There is a long-term benefit to the industries that use garnet. Having a stable long-term guarantee of garnet supply allows users of garnet to design and construct systems which incorporate garnet use. In addition garnet has many applications in other industries. A long-term supply is a benefit to these industries, the customers they serve, and overall to the local and regional economies and the public in which they operate. There are also long-term benefits to the Benewah and Shoshone regional economies involving continued employment of ECG workers and other economic benefits of continued mining through indirect and induced jobs.